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Press Work on Radio and Telephone Parts

By Frank J. Oliver, Jr.
Editorial Staff, *American Machinist*

A stable market has warranted the tooling for rapid production of high-quality standardized parts—Blanking, drawing, forming and perforating operations are involved

MANY press-work operations are performed at the plant of the Stromberg-Carlson Telephone Manufacturing Co., Rochester, N. Y., where radio, telephone switchboard, and other telephone apparatus are made. This company occupies a stable position in these fields and hence the use of expensive dies is warranted in order to obtain the reduction in cost of manufacture that comes with quantity production. A few of these operations will be described.

The manufacture of a metal wall telephone presents some diverse problems. The base is shown in Fig. 1, while Fig. 2 shows the appearance of the part after six successive press operations, of which there are eight in all. The material is No. 18 U. S. gage (0.050 in.) coldrolled strip steel and the part is blanked in a No. 6 Toledo press from sheets 8 in. wide by 8 ft. long.

The second operation is one of forming or drawing and it takes place in a Consolidated geared press. The result of this operation is shown at *A*, Fig. 2. Trimming of the fin follows in a No. P-4 Ferracute press. The piece is then returned to the Toledo for notching of the hole for admitting the outside connecting wires. This hole can be seen at *B*, Fig. 2. In the fifth operation the four large irregular holes in the top are perforated, together with a circular hole $\frac{3}{4}$ in. in diameter and the twelve small holes that are later tapped or eyeletted. A No. 75½ Bliss geared press is used, and the result is shown at *C*. Fig. 2. The shearing and the first step in the forming of the two lugs in the central opening is next in order. This operation is performed in the same Ferracute press as was used for the third, or trimming operation. The lug is finally formed at a right angle to the plate in the subsequent operation in which the embossing of the five ribs and the countersinking of the twelve small holes, previously perforated, also take place. This operation is performed in the No. 76 Consolidated punch press. The results of this and the preceding operation are shown at *D* and *E* respectively in Fig. 2. The final press operation is to perforate the hole 0.172 in. in diameter in each lug. This is done in the No. 6 Toledo press and at *F* in Fig. 2 the result is pictured.

After being sandblasted the bases are Parkerized, the edges are scratch brushed, and the pieces are japanned by air spray and then baked, three coats of japan being applied. The seven No. 6 holes and the one No. 10 are then tapped 32 threads per inch.

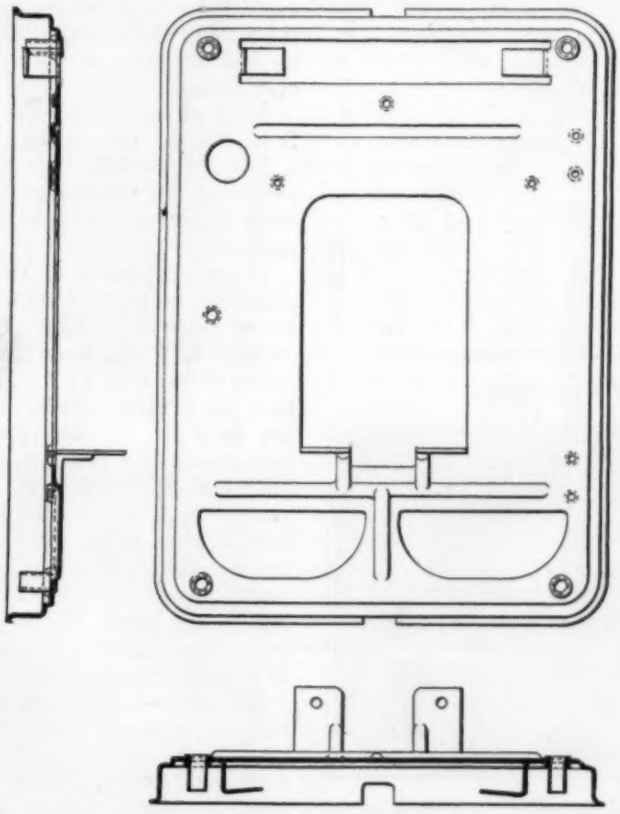


Fig. 1—Base for telephone case

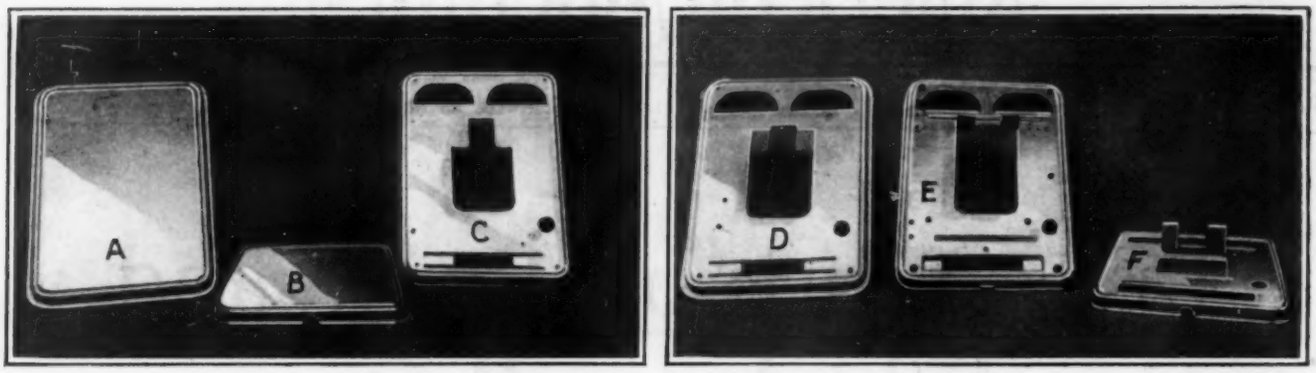


Fig. 2—Steps in the manufacture of the base for a telephone case

The cover of the metal wall telephone and its appearance after successive press operations is shown in Fig. 4, together with a completed phone unit. The cover is the companion piece to the base, the manufacture of which was just described. The material used is No. 18 U. S. gage cold-rolled strip steel. Seven pieces are obtained from a strip 12 in. wide by 99¼ in. long. The strip is oiled and the blank is punched out in the No. 6 Toledo press. The blank is then drawn in a No. 164½ Toledo toggle press. After being washed the part is trimmed in a No. P-4 Ferracute press.

The forty-six sound holes in the bottom side of the cover are next perforated in a P-3 Ferracute press as

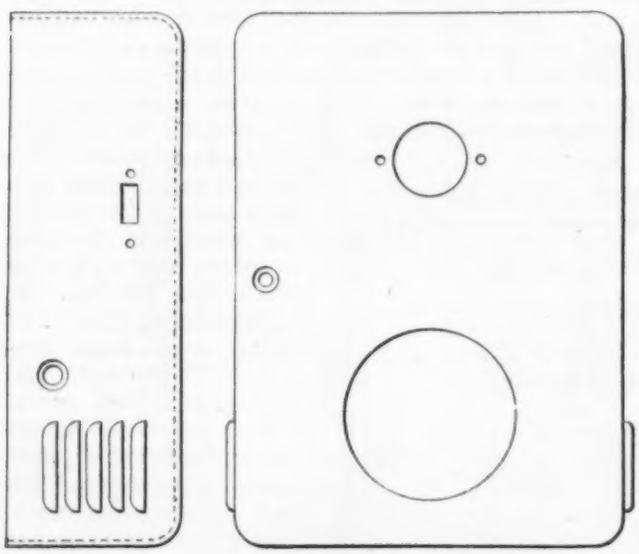


Fig. 3—Cover of a phone box

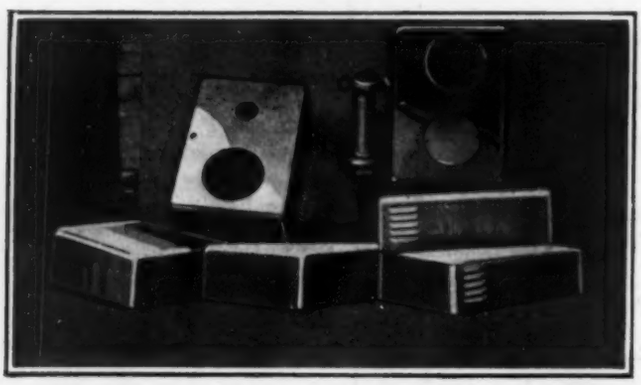


Fig. 4—Results of various operations on a phone box cover

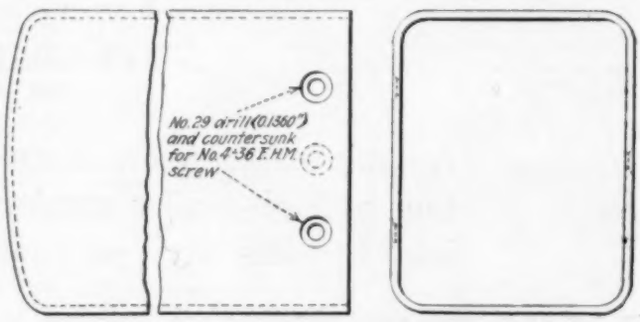


Fig. 5—Aluminum shell for telephone relay

are the hole for the phone cord and the hole for the hook on the left side in the following operation. The hinge slots on the right side are perforated next in a Bliss geared press. The same Ferracute press is then used to shear and form the shutter-type ventilators on each side. The two large circular holes and the two small holes adjacent to the top hole are perforated in the face of the cover, after which the single screw hole on the left side is punched and embossed as a final operation.

After all the press work is completed each box cover is inspected. Covers that are cracked at the corners—a defect caused by the shearing operation on a small percentage of the covers—are welded and then ground. Bent boxes are straightened by means of a rawhide mallet.

The manufacture of the aluminum shell for a telephone repeating coil shown in Fig. 5, involves a number of press operations. The material is No. 16 B. & S. (0.0508 in.) soft sheet aluminum that is purchased in strips 6½ in. wide by 8 ft. long. The pieces are blanked in a No. 6 Toledo press. Three drawing operations follow in a No. 1½ Bliss press. The blank is oiled and first drawn to a cylinder, then annealed and drawn to a rectangular section with rounded corners approximating its final shape. The last draw is completed in two strokes and shapes the bottom and wall to the dimensions shown in Fig. 5. The rough ends of the shell are next trimmed in a No. P-3 Ferracute press in two setings. The three No. 29-drill holes are perforated in two steps, one hole in one side and two in the other, in a No. 4 Toledo press.

The shells are washed and inspected, after which the curved end is surfaced with a rattan scratch brush in preparation for the japan finish. The three holes are first countersunk for flat-head screws by means of a sensitive drill and then the japan is applied with an air brush and baked on the shells in an oven.

In Fig. 6 is shown a drawing operating on a cylindrical shield for radio inductances. The finished case is about 3¼ in. in inside diameter and 4⅜ in. in inside height. The material is 18-oz. (0.0246 in.) soft copper and is purchased in the form of blanks 8⅜ in. in diameter. The part is drawn in two operations in a No. 164½ Toledo toggle press. The blanks are well smeared with lard oil to prevent the punch from perforating the piece due to the copper sticking to the drawing ring.

The case has rough ends resulting from the drawing operation, and it is placed in the collet chuck of a turret lathe, where it is cut off to exact length. As the tool tends to tear this light material, a file is run over the edge to obtain smoothness. Fig. 7 illustrates this operation. Three No. 21 holes (0.159 in.) spaced 120 deg. apart can now be perforated around the periphery of the shield ¼ in. from the open end just finished. After inspection and cleaning the shield is given a black Duco finish with an air spray.

The perforating die-set for the cover of a loud speaker case is shown in Fig. 8 together with a sketch of the part, which is made from No. 23 B.W. gage (0.025 in.) cold-rolled strip steel. The pieces are blanked out of a strip 5 in. wide by 48 in. long. The blank is drawn in a No. 76 Consolidated geared press, and in the same press the perforations in the top of the cover are made in the following operation with the die set illustrated. The hole 0.344 in. in diameter in the side wall is punched and embossed in a No. 3 Ferracute press. The cover is then placed in a collet chuck in the same turret lathe as shown in Fig. 7 and is faced, then filed.

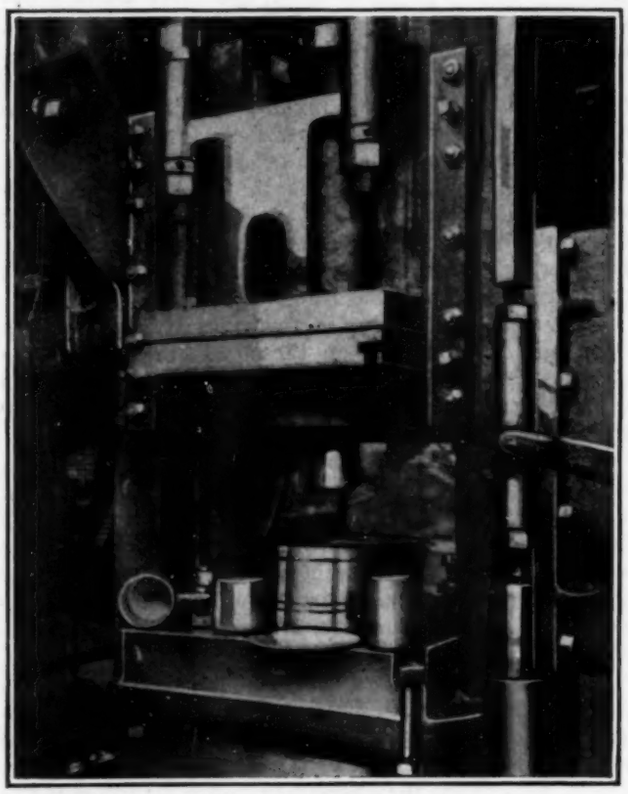


Fig. 6—Drawing cylindrical shields for radio inductances

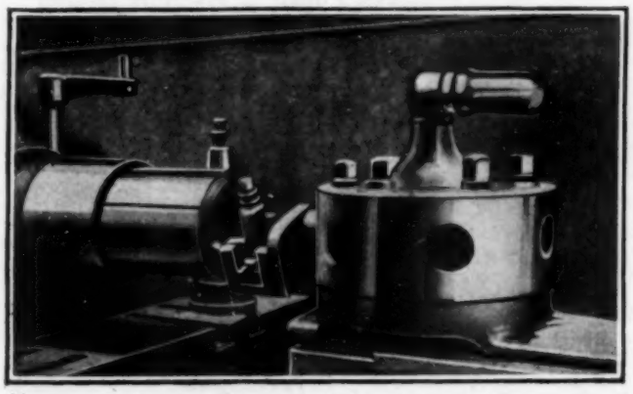


Fig. 7—Trimming the shield to size

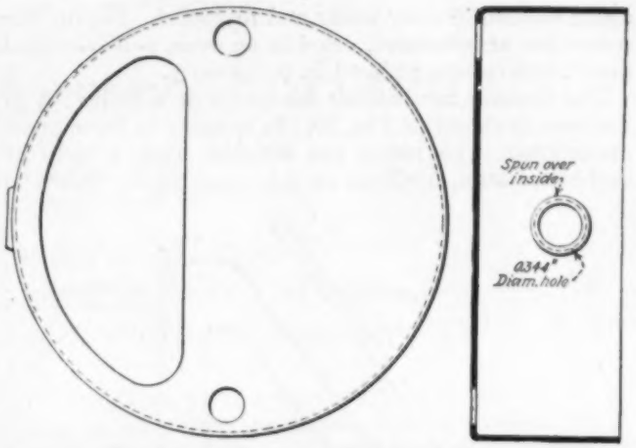


Fig. 8—Perforating die-set for loud speaker case

The finishing operations are rather intricate. The part is sand-blasted, Parkerized, washed, and dried. The outside is then surfaced with a rattan scratch brush, but before the piece is lacquered the eyelet is assembled in a kick press. Hilo black crystallizing lacquer is then applied with an air brush and is allowed to crystallize and bake for several hours in an oven, the temperature of which ranges from 350 to 450 deg. Fahrenheit.

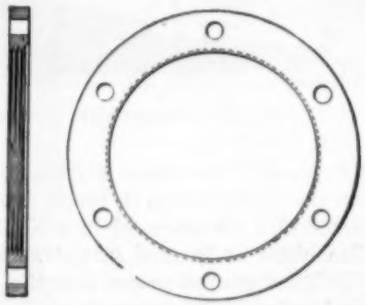


Fig. 9—Clamping ring for loud speaker unit

The clamping ring, Fig. 9, for the same loud speaker unit requires several diverse operations to produce it. The annular ring is blanked out of No. 4 B. & S. (0.204 in.) H. H. sheet brass, which is purchased in strips 6½ in. wide by 8 ft. long. The six holes are perforated in a following operation in a punch press. The rings are then washed in clear water and inspected. The recess is bored and the 60 deg. V-threads, 24 to the inch, are tapped in a turret lathe. The face is also lapped to a smooth flat surface in the same set-up. The rings are

again washed in clear water and inspected. Finally the pieces are nickel-plated, dried in an oven, and inspected again, before being placed in parts stock.

The bracket for holding the panel of a radio set to the base is shown in Fig. 10. It is made in three press operations. The pieces are blanked from a strip of cold-rolled steel, 0.062 in. in thickness, 8½ in. wide and

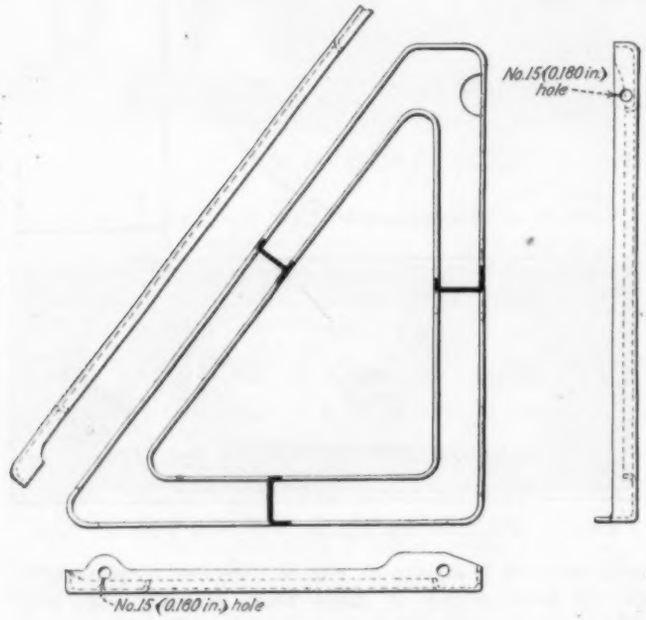


Fig. 10—Bracket for radio panel

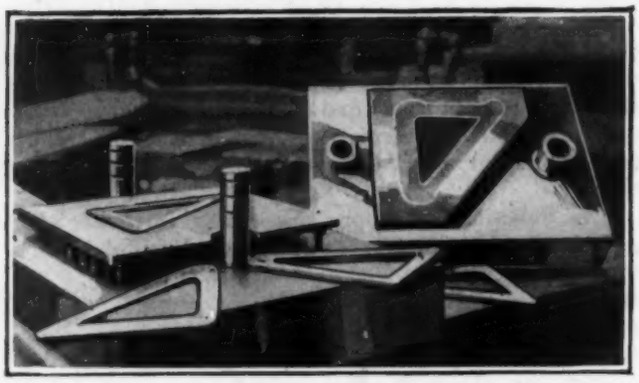


Fig. 11—Die-set for blanking radio bracket

8 ft. long. The die-set for blanking the piece and piercing the ⅛-in. radius sector is illustrated in Fig. 11. The punch and die are used in a No. 306 Bliss geared press. The blank is formed in the second operation in a No. 75½ Bliss geared press, and the three No. 15 holes are perforated in two steps in a No. 4 Toledo press. After inspection and counting, the bracket is washed, copper plated, washed again, nickel plated, and dried.

A recent instance of service shows the great value of co-operation in the field force. A machine bearing failed in an important plant. The superintendent wired the district salesman who received it in New York at 10 p.m. He wired the service man who was in Boston, reaching him, in bed, at 11 p.m. The service man dressed, checked out, caught the midnight train to New York and was at the shop in New Jersey when the super arrived next morning. That's service.

Featuring High Spots in Design

In addition to its usefulness as a reference for the recently developed metal-working machinery and shop equipment, the *American Machinist* Semi-Annual Review Numbers make an excellent source of information for the machine designer on existing conditions and on trends in design.

The latest, Vol. 65, No. 3, issue is here used to illustrate the point by making an analysis of certain high spots and by listing the results in terms of per cent. Included in the description of equipment put on the market between January and July of this year, there are 143 American-built machines and pieces of equipment.

General-purpose machinery is shown to be favored to a considerable margin over either the single purpose or the convertible types. Manual operation is also a good deal more in evidence than automatic or semi-automatic design. On this point, however, the favor would probably swing the other way more strongly were certain types of machinery singled out.

Drive is by motor in the majority of cases, with a number of builders favoring separate motors for individual functions. A comparatively few specify belts. Certain others leave choice to the purchaser.

Bearings, on the machines in which this point is featured, show ball or roller design to be considerably more in favor than the plain type. It is to be noted here, however, that approximately one-half of the builders do not feature this point.

Feed design is shown to favor positive drive, with hand operation second, on those machines where the point is specified. An interesting development in this connection is the use of hydraulic feed, which is gaining in favor.

Lubrication, as might be expected, is spread over a number of types with splash and pressure in somewhat greater favor than the others. A great deal remains to be accomplished in this connection, however, on the average machine. The point is not featured in a little over half of the cases, regardless of the fact that lubrication, or rather its failure, is responsible for a majority of machinery breakdowns.

Control design shows favor on the part of certain builders for the push button. Unit mounting of apparatus for this important function, however, could be advantageously featured to a greater extent than it is now. Altogether, the analysis uncovers several items to which the designers can give thought.

Analysis of Featured Points in Machine Design

Function	Per Cent
Single purpose	13
Convertible	15
General purpose	72
Operation	
Automatic	15
Semi-automatic	21
Manual	64
Drive	
Motor	68
Belt	7
Alternative	10
Individual function	15
Bearing	
Ball or roller	31
Plain	18
No specification	51

Feed	Per Cent
Positive	43
Friction	6
Hand	21
Hydraulic	6
No specification	24
Lubrication	
Gravity	9
Splash	17
Pressure	11
Centralized	4
Wick	3
Grease	3
No specification	53
Control	
Push-button	17
No specification	83

Developing the Armco Foremen

By A. J. Beatty
Director of Training, The American Rolling Mill Co.

Foreman training, or development, has been in successful operation for several years at Armco—Fundamentals of the course and how they are developed

ANY effective program for the development of foremen must be based upon the three principal functions of the foremen. While it is possible to analyze the foreman's job into a large number of specific functions or responsibilities, these several specific functions naturally group themselves into three major groups of functions:

I. Management functions.
II. Supervisory or production functions.
III. Organization building.

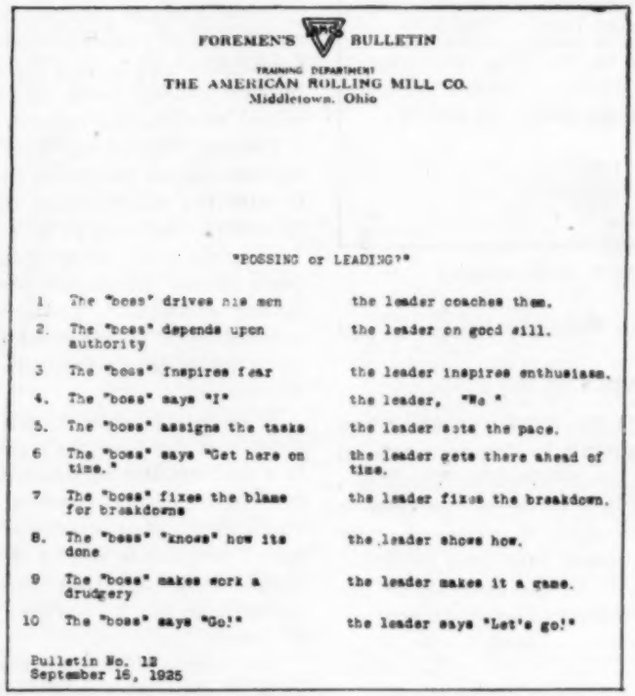
To complete the program of foreman development, these three must be prefaced with another topic which we call the Foreman's Personal Equipment. It is not a part of the present discussion. With these three main functions in mind—assuming that the men who are now foremen have, for the most part, the requisite personal equipment for their jobs, The American Rolling Mill Co. has worked out, through several years of experimental work, largely cut-and-try, what seems to be a fairly adequate and well-rounded program for the development of Armco foremen. The term "development" of foremen is used advisedly rather than "training." Training is not quite the right term, for training means the development of skill, rather than the expanding of the foreman's point of view, and his attitude to such a degree that he realizes and appreciates the importance of his function as a part of the management of the company.

The successful operation of any industry depends upon the soundness of its business policies, and upon the intelligence and aggressiveness of its management. The officers of a company, the management, may be actuated by the highest ideals of business conduct in their relations with their customers, and in relation to the public in general. But these ideals and standards are effective only to the extent that they are understood and practiced by the entire organization.

Here is where the foreman comes in. He must be led to realize that he is a part of the management of the company, and that the ideals, standards, and policies of the company must be his personal ideals and standards in all dealings with the men of his organization.

Foremen have certain very definite management functions: Interpreting company policies to their men, passing on information on business and operating conditions, watching quality and costs, and building good will in their own organization and on the part of the public.

Some foremen, who have come up through the ranks, find it difficult to assume all these management responsibilities, and to get into the frame of mind where they can discharge them effectively and wholeheartedly. They are perfectly willing to assume and discharge their production and supervisory responsibilities—they acknowledge these without question—but management and its responsibilities are beyond them. "That is what 'management' is paid for."



FOREMEN'S BULLETIN

TRAINING DEPARTMENT
THE AMERICAN ROLLING MILL CO.
Middletown, Ohio

"BOSSING or LEADING"

1	The "boss" drives his men	the leader coaches them.
2.	The "boss" depends upon authority	the leader on good will.
3	The "boss" inspires fear	the leader inspires enthusiasm.
4.	The "boss" says "I"	the leader, "We "
5.	The "boss" assigns the tasks	the leader sets the pace.
6	The "boss" says "Get here on time."	the leader gets there ahead of time.
7	The "boss" fixes the blame for breakdowns	the leader fixes the breakdown.
8.	The "boss" "knows" how its done	the leader shows how.
9	The "boss" makes work a drudgery	the leader makes it a game.
10	The "boss" says "Go!"	the leader says "Let's go!"

Bulletin No. 12
September 16, 1925

A foreman's bulletin on leadership

Therefore the hard task in foreman development is to lead the foreman by gradual steps into this larger, broader view. It cannot be done in a day or a year. No imported course in industrial management can accomplish the task. It can only be done by years of patient, man-to-man contact between foremen on the one hand and a sympathetic management on the other.

Once the foreman is educated to the point where he admits that he is an important part of management and is willing to assume his management responsibilities, it then becomes incumbent upon the management to discuss with the foreman his management responsibilities in detail.

Part I of our main outline is therefore broken down into the following sub-divisions:

a. What is management in industry?
b. Company policies and their interpretation
c. The foreman's responsibility in building good-will
d. Company standards of quality and inspection

FOREMEN'S BULLETIN

TRAINING DEPARTMENT
THE AMERICAN ROLLING MILL CO.
Middletown, Ohio

HAVE YOU AN UNDERSTUDY?

Every leading actor and concert artist has an understudy, who is ready to sub in the leading part in an emergency.

In a similar manner and for the same reason, every supervisor in an industrial concern should have an understudy, so that in case the supervisor is absent, his work may not suffer.

There are three very good reasons why you should have an understudy:

1. The keeping up of production, and the prevention of delays in your absence.
2. The development of younger men, preparing them for promotion.
3. Having a man ready to step into your place when your chance for promotion comes.

Each of these reasons is important. You cannot successfully hold your own job, unless your organization keeps production going normally even in your absence; you cannot build up your organization, and build good will for the company if you are not interested in bringing likely youngsters along; and you cannot expect a promotion yourself unless you have a man ready to step into your job, when your chance comes.

If you haven't already done so, better be lining up an understudy.

Bulletin No. 18
October 28, 1925

The bulletin dealing with understudies

e. The relation of costs to company progress and stability
f. Building good-will on the part of the public

Each of these main topics is the basis of one or two discussions, with a view to giving to the foreman an adequate conception of what is involved in the topic, and advising with him as to how he is to function in this particular phase of management, and especially how he can make these management functions effective.

The chief items which appear in the analysis of the foreman's production and supervisory functions are:

a. Planning work
b. Scheduling work
c. Keeping work moving
d. Keeping up quality
e. Keeping down costs
f. Maintaining production standards
g. Maintaining standard practice.

There are, in addition, such items under this heading as factory lay-out, arrangement of machines and equipment, and disposition of floor space. But the responsibility for these items is usually shared or wholly assumed by some one higher in authority, and may therefore be omitted from this outline.

Each of the seven topics is made the subject for at least one discussion period. And since the department superintendent or the functional foreman—or both of them—is so close to each of these responsibilities, it is desirable, if not essential, that one or both of them participate in these discussions. It will be noted that the topics "Keeping Up Quality" and "Keeping Down Costs" appear also among the foreman's management responsibilities; but there need be no confusion on this account. They appear among management responsibilities, because "official" management is constantly in close touch with them. They demand not only the continuous attention of every foreman but also that of the highest officials of the company. This latter fact when brought to the attention of foremen readily adds interest and zest to the discussion of these topics.

Part III of our outline is analyzed as follows:

1. Teaching men their jobs
   a. What is teaching? training?
   b. Organizing material for instruction
   c. Methods of teaching specific jobs
2. Developing men
   a. Introducing the new man
   b. Teaching the safety attitude
   c. Team-work and co-operation
   d. Correcting faults and friction
   e. Developing judgment—"How We Think"
   f. Developing an understudy
   g. Understanding men—"Why Men Work"
   h. Understanding men—"Levels of Intelligence"

If the average foreman balks at being asked to assume management responsibilities, he is even slower to acknowledge that he is a teacher. His production responsibilities usually loom large enough to him to fill his entire horizon—he cannot see himself as teacher at all.

Usually, therefore, it is necessary to spend at least one discussion period on the outline of Part III in order to convince the foreman that he is a teacher, and that, in reality, teaching is by far the largest part of his job. This much done, each topic of the outline is used as the basis of one discussion period. The sequence of topics is not essential. There may come at any time the psychological moment when some particular topic will force itself into the group for the present or the next discussion.

It is worth while to tell briefly of the study of economics in our foremen's group. We all know that there is a vast amount of unsound economic theory in circulation in industrial centers; and we undertake to offset and combat this spurious economics by fundamentally sound economics, not of the college type but couched in simple language that foremen can easily grasp, and directed so far as possible at the problems of our own business.

The length of our outlined courses for foremen varies greatly, depending much upon the purpose of the course. Some of our groups in economics, metallurgy, and industrial chemistry extend over six to eight months, while some of our more specialized courses, such as gas making and sheet defects, have had only six or eight sessions. In these courses a definite aim is set up, and when that aim is accomplished the course is concluded whether it has been running a few weeks or several months.

Just as the foreman is necessarily the proper man to teach and train his men, so the department superintendents and the technical staff of our organization are the logical and psychological instructors of the foremen.

So we try just as far as possible and systematically, too, to have our study groups in charge of key men, and specialists, and especially department superintendents.

For example, for several years in our study of open hearth practice, of metallurgy and of gas producers, the instruction has been done by the open hearth superintendent and his first assistant.

So also in a recent group of sheet mill foremen studying sheet defects, our chief inspector had charge of the group, assisted by the assistant general superintendent, who is without doubt the best informed man in our company on sheet mill practice. Sometimes these key men may be a little short in pedagogy, but their expert knowledge of their subject matter more than offsets this shortcoming.

The means and methods employed in our program for development of foremen include:

1. Discussion and Conference Groups
2. Special Safety and First Aid Training
3. The Foremen's Forum
4. The Foremen's Bulletin

Our experience is in line with that of practically every other successful attempt at foreman training: that the group conference method is not only the soundest pedagogy but the results, we believe, justify our opinion that it is by far the most successful.

We have tried discussion groups varying in size from ten to seventy-five, and our experience leads us to believe that the smaller the group, the more successful is the conference—provided it is not too small to give a variety of opinions and experiences. It is practically impossible to get men to open up with questions and discussions in a group of more than fifteen to twenty.

When the subject matter to be presented is of such a nature that a lecture or address is necessary or advisable, we, of course, have larger groups. We use this plan when we can have one of the higher officials of our company to present some important topic of company business or company policy, and also when we are able to secure some prominent outside speaker on a subject of technical or general interest.

Our first step in organizing discussion groups for foreman development was to enlist a smaller group of leading foremen—in the first instance, six in number, which is called the Foremen's Cabinet. The men selected for this cabinet were successful foremen judged by their record of accomplishment in getting work done and in developing men.

The Foremen's Cabinet serves in an advisory capacity to suggest topics for group discussions and to recommend group chairmen. Cabinet members themselves frequently serve in the capacity of group chairmen.

The Foremen's Cabinet is not a fixed group. Each member is invited to serve for three or four weeks. He then drops out to make room for another man, who is selected to fill his place, generally on the basis of his interest and activity in discussion groups. This plan provides enough hold-over men to give a degree of permanence to the cabinet and, at the same time, the addition of new members constantly introduces new blood and new points of view.

The question as to whether accident prevention and first aid instruction should be classified among the foreman's management functions, or with supervisory functions, or teaching functions is a minor one. But the importance of these responsibilities was long ago sensed by the management and several years of intensive work have resulted in a thorough inoculation of the entire organization with the safety attitude.

In co-operation with the United States Bureau of Mines, first-aid classes have been conducted for the entire foremen's group, and these classes have also enrolled many below the rank of foremen. Practically every foreman in the company is a graduate.

Whenever our management has any important message to get over to the foremen, relating either to company policies or to business conditions, or to any important change in working conditions, the entire foremen's group is called together in what is called, officially, "The Foremen's Forum."

While occasionally a set address makes up a part of the forum meeting, it is in reality a large group discussion, for it is in every sense a real forum where questions are asked, where discussion is invited, and where explanations are asked for and expected.

No important move is ever made by the management, in which foremen are vitally concerned and interested, without calling together the Foremen's Forum to lay the matter before them to explain the necessity and the reasons for the move, and to enlist their hearty co-operation in putting it into effect. The result of this plan is that foremen are thoroughly informed on proposed changes, and can help to put them into operation intelligently; and what is more important, they can explain to their men, in giving their instructions, just why the change or move is necessary. This obviates the danger of any feelings of arbitrariness on the part of management in the minds of the foremen and men.

Perhaps the one feature of our program for developing foremen that reaches the greatest number is the *Armco Foremen's Bulletin.*

This is a one-page, mimeographed bulletin which is

FOREMEN'S BULLETIN

TRAINING DEPARTMENT
THE AMERICAN ROLLING MILL CO.
Middletown, Ohio

HOW TO HANDLE THE BOSS

HANDLING MEN is a large part of the foreman's job. But in most discussions, "Handling Men" means "Handling Subordinates." However, "Handling the Boss" is often a much harder job, although sometimes an equally necessary and a more important one.

"How to handle the Boss," does not mean "How to work the Boss," nor "How to get a pull or stand in with him." It simply means, how to sell your ideas to him, how to secure his approval of the things which you consider are important for the improvement of your department.

To handle the boss requires the same kind of ability as the successful salesman has when he makes a good sale to an important man. Both cases require a knowledge of the personality of the man you would influence. You must know his likes and dislikes, his hobbies, and his whims. You must know whether to approach him with a new idea directly, or whether to lead up to it gradually.

Here are a few rules or suggestions which will help:

1. Choose the time to approach the boss, when he is at leisure, and not worrying about other matters.
2. Be sure you know your "stuff." Have your ideas clear in your own mind. Know what you are going to say, and how you are going to say it.
3. Anticipate the boss's objections, and be prepared to answer them.
4. Don't spring a half-baked idea or inspiration on him, just to make Him think you are progressive.
5. If the boss is entitled to part credit for your suggestion through some hunch which he has given you, don't fail to mention it.
6. Be loyal to the boss. If he doesn't favor your proposal at once, don't go over his head.
7. Be persistent, but patient. If your idea is a good one, don't give up if it is not immediately adopted.
8. Don't try to hurry a decision by arguing. As soon as you start an argument, you place the boss on the defensive in opposition to you and your idea.

As soon as your proposal is adopted, call it "our" plan, and work to make it a success. If it succeeds, the "Boss" will be much more easily handled the next time.

Bulletin No. 23
December 2, 1925

Bulletin No. 23—How to handle the boss

issued weekly by the training departments, and is sent to every foreman of the company and also to every man of higher rank than foreman.

Each bulletin is confined to a single topic—of management, or of production, or of organization building, or of economics, or of personal development. Several of these bulletins are reproduced in the accompanying illustrations as samples of one important means of developing foremen.

This program of foreman development has been in the making for twenty-five years; it is still in the making. Many things have been tried without noticeable beneficial results, and have been abandoned for other more promising devices. Some of the present plans will doubtless be found in the discard in the future.

But throughout all this experimentation, there has been a sincere desire on the part of management to develop a spirit of intelligent co-operation which is the essential basis of industrial stability and progress.

Are Profit Ideals High Enough?—Discussion

By G. E. Conkling
Marketing Counsellor, McGraw-Hill Publishing Co., Inc.

THE article on profit ideals on page 189, Vol. 65, illustrates the relationship of better marketing methods to profits.

Contributors to this article agree that the rate of profit on machinery is frequently lower than is justified by the best interests of all concerned. Theoretically, it is true that the manufacturer might raise his price to include the proper profit. There are some lines where this practice undoubtedly would be justified and the manufacturer would be rewarded for his courage in demanding what the product really was worth. Practically, however, there are so many lines in which the new price would simply set up additional sales resistance that the manufacturer might be just as apt to go down hill instead of up hill if he adopted the practice.

This really opens up the whole subject of Marketing Methods. If the price cannot be raised, can the manufacturer, by better marketing, distribute his products so that he can make a fairer profit without asking more from the buyer? As an example of the possibilities, we might cite the case of two manufacturers whose statements I have recently examined. The figures quoted are purposely altered to avoid disclosing the identity of the companies.

Company "A" manufactures several somewhat related lines of industrial machinery. Its business has averaged over $10,000,000 a year and has been fairly steady. The net profits, however, have been less than 3 cents per dollar of sales. Company "A" markets on the theory that any company irrespective of size or business is a prospect. As a result, its shops are full of specials. The average order is relatively small and the average salesman handles a comparatively small volume of business a year because he has to dissipate his energies over many unrelated prospects, most of them of small caliber, and is rarely in a position to serve any as a specialist.

Company "B" manufacturers a similar range of products, in fact is a direct competitor of Company "A" in some lines. Company "B" is not charging any higher prices than Company "A" but is making a net profit of 11 cents per dollar of sales. Incidentally, Company "B" does a gross business considerably larger than Company "A." Company "B" does not believe that every smoke-stack is an equally good prospect. The company markets by giving special attention to the industries that have the greatest need for the products and offer the most attractive business. Company "B" studies the volume of purchasing of these preferred prospects and selects enough of these groups to guarantee volume and stability, assuming that a reasonable percentage of the business of each is obtained, then goes after this business as a specialist. The salesmen of Company "B" concentrate.

As a result of this policy Company "B" gets larger volume; its shops are not filled with specials. It gets a larger profit on each dollar of sales and it does this not by charging the customer more but by being a better merchant. In proof of this, the inventory item of the two companies is significant. Company "A" is forced to carry 60 cents in materials, factory and warehouse stocks for each dollar of sales. Company "B" through its method of marketing requires only 30 cents per dollar in similar inventories. If Company "A" could save the 6 per cent interest on the difference in inventories alone, its profits would double.

The main point in the comparison of these two companies is that if Company "A" could develop marketing methods as good as those of Company "B," it could more than treble its profits on its present volume of business without changing prices.

Marketing Methods Must Be Changed

Another very common relationship between marketing and profits is illustrated by Company "C." This concern manufacturers a small special machine which is now being generally used in industry and sells for about $400. With a few exceptions the customer rarely needs more than one or two machines. Company "C" sells about $200,000 worth of these machines a year and is not yet making any money. Now, Company "C" has its own salesmen and sells these machines by chasing the salesmen after inquiries. As a result, the salesmen jump long distances from day to day and do not appear in any locality frequently enough to do consistent missionary work. By no stretch of the imagination can there be enough profit in this $400 machine to stand the personal traveling expenses charged against it under the marketing method now employed. Company "C's" marketing must settle down. The company probably will either add other equipment and have a line with a large enough unit of sale to pay its way or will arrange for local representatives to do the work now done by the travelers. There is a good profit in Company "C's" machine but the company cannot get this profit out except through a change in its marketing methods.

The cases of companies A, B and C are simply straws that show which way the wind is blowing. Today the marketing method in its broader aspect is being looked to quite generally as the solution of profits. Better marketing not only should create a larger volume of business but very frequently cause reductions in production, engineering and other costs and these reductions become a reservoir from which a fairer profit may be drawn with satisfaction to the buyer and the seller alike.

Making Fine Taps in a Modern Tool Shop

All material is subjected to chemical analysis and physical tests before being racked—Different methods employed to make different kinds of taps

IN THE Small Tool Division of the Pratt & Whitney Co. at Hartford, Conn., all of the material that goes into the manufacture of taps and dies, cutters, reamers and similar tools, is received in the room shown in Fig. 1, where each bar of stock is marked for identification and a small piece cut from it to be sent to the laboratory for analysis. Not until the laboratory report is returned, giving, in conjunction with the physical tests here applied, a complete knowledge of the characteristics of each bar, is the material sent to the main stockroom to be racked.

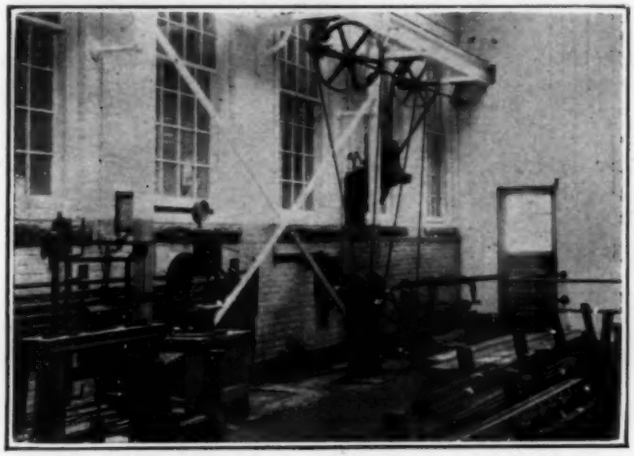


Fig. 1—Receiving room for steel shipments

The layman, to whom all steel is steel, would not perceive at once the need for the fine discriminations that are made, but to those who have been closely associated with the manufacture of fine cutting tools for nearly three-quarters of a century it is clearly apparent. Mild steel that is hardened only by carbonization, alloy steels of many varieties that require special heat-treatment, and the best grades of high-speed steel that also demand the fullest knowledge of their properties in order to bring out their advantages are included in the raw material from which these tools are made.

A view in the main stockroom, giving an idea of the many kinds, sizes and shapes of steel that are here segregated in compartments marked to receive them is the subject of Fig. 2. Each separate shipment bears a tag showing the date of its receipt, the mill from which it came, and the characteristics of the steel as determined by the laboratory reports.

The stockroom is located in the basement of the main factory building, while on the floor above it is the cutting room where the bars are reduced to lengths specified by the individual shop orders, and also a battery of screw-machines to perform the first operations upon such tools as cutters, ring-gages, etc., that can be formed from the bar. A special elevator, so constructed that full-length bars can be handled quickly and easily, provides for the transfer of material.

In the manufacture of taps as conducted by Pratt & Whitney, several methods are followed depending upon the size of the tap, the purpose for which it is intended, the material of which it is made, and, more than all else, perhaps, the number of taps of one kind that are to be made upon a given shop order. If they are of more than ordinarily large size, and especially if there are but few of a kind to be made, the job is carried forward by methods that are common to any toolroom. If the quantity is large, the operations are practically all performed upon automatic and semi-automatic machines.

As would naturally be expected in a shop so closely allied with one of the oldest and most extensive machinery building establishments in the country, the standard and special automatic machinery employed is largely the product of the Pratt & Whitney Machine Division. In Fig. 3 may be seen an automatic centering machine, to which the stock is delivered in lengths to make one tap each, and which delivers the blanks centered at both ends and ready for the automatic turning lathes.

The next step is to turn the blanks to the required size, which is done by Pratt & Whitney automatic production lathes, one of which is shown in Fig. 4. This machine is a development that is somewhere between a regular turning lathe and a screw-machine. Like the former, it supports the work upon centers and removes the stock by means of a single-point tool that is car-

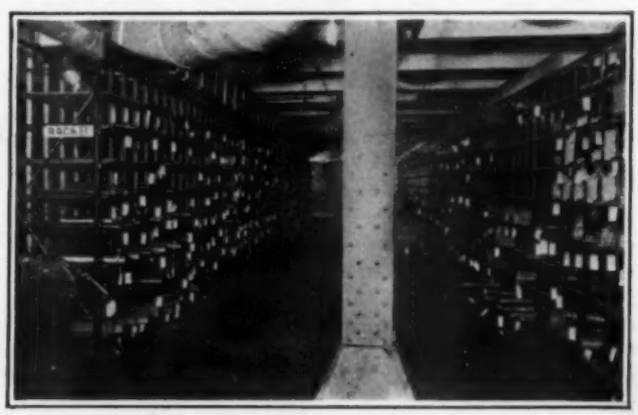


Fig. 2—The raw stockroom

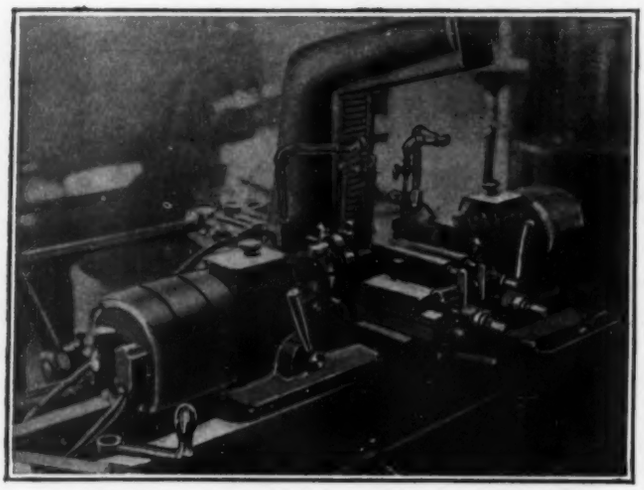


Fig. 3—The automatic centering machine

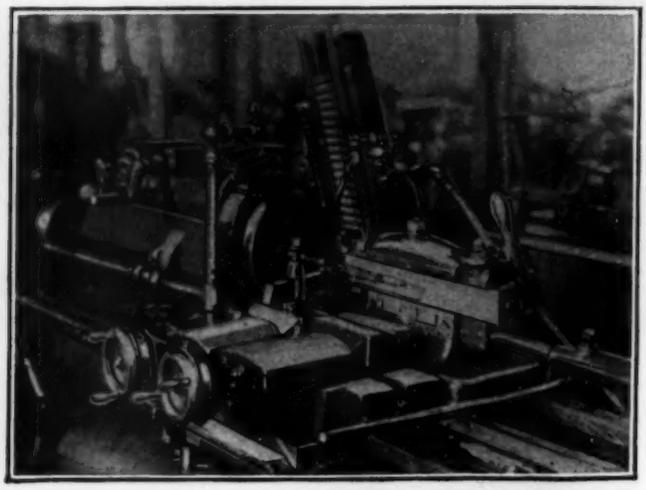


Fig. 4—An automatic production lathe

Fig. 5—Electrically heated lead furnaces

Fig. 6—The gas-fired high-speed steel furnaces

ried by a slide-rest; like the latter, its movements are continuous and entirely automatic.

The pieces as they come from the centering machine are stacked in a magazine that may be seen behind and above the centers in this illustration, and the operator has only to see that there are pieces in the magazine, and to gage the product from time to time. There are four operations—a rough and a finish turn on both ends of the blank—for which four machines are employed under the supervision of one operator.

Different Methods of Cutting Threads

Three methods of cutting the threads are employed, depending upon the quality of the tap and the number to be made to one set of specifications. Single taps or small orders are threaded on a screw-cutting lathe in very much the same way that a toolmaker would do the job. On larger quantities a multiple cutter—a hob without a lead—cuts the thread complete in one revolution of the work, which is moved endwise during the cut under the influence of a master-screw of corresponding lead. Both semi-automatic and full automatic machines are used.

On some classes of taps the threads are cut with dies by a special machine in which the lead is governed by a master-screw. Two cuts, a rough and a finish, are made over each piece. These machines are fully automatic.

Whether the flutes are cut before or after the threading is done depends upon the manner of doing the latter. On all milled thread taps, by whatever machine they are milled, the flutes are cut in a preceding operation. On taps that are threaded with a single-point tool or with a die the fluting must necessarily follow the threading. In either case the machine most commonly employed for the purpose is a milling machine of the Lincoln type or a Pratt & Whitney semi-automatic, on which is a fixture to support three or more taps on centers.

Taps that are to be used with a wrench must have a square milled on one end. Here, again, there are two methods; one making use of the Pratt & Whitney semi-automatic milling machine and the other of a specially designed machine that is fully automatic. The first has to be reloaded by hand after each cycle; the second takes the pieces from a magazine. This work may be done either before or after the other operations, but usually squares the blanks before they are threaded.

Furnaces for the Hardening Heat

In Fig. 5 is shown the row of electrically heated lead furnaces, built by the American Metallurgical Corporation of Boston, in which all carbon steel tools are hardened. On the opposite side of the room, Fig. 6, may be seen the gas-fired furnaces to harden tools that are made of high-speed steel. Sundh control panels, with Brown pyrometers, regulate the temperatures automatically and maintain them within very close limits.

Automotive Production

How Production Methods Vary in Shops Building "Light Sixes"

By Fred H. Colvin
Editor, *American Machinist*

Some of the tools, fixtures and methods used in machining crankcases in the Oakland plant—Special machines that aid in securing accuracy

THE Oakland crankcase is cast iron, and is surfaced in two operations on Newton, horizontal table, rotary-type milling machines. Fig. 1 shows one of the machines at work on the upper surface, or cylinder-block face. The other operation is very similar. The clamping is simple, as can be seen. The two cutters at the left take the roughing cut, while the large cutter at the right does the finishing. The large, single cutter eliminates any difference in height that might be left by the use of two cutters.

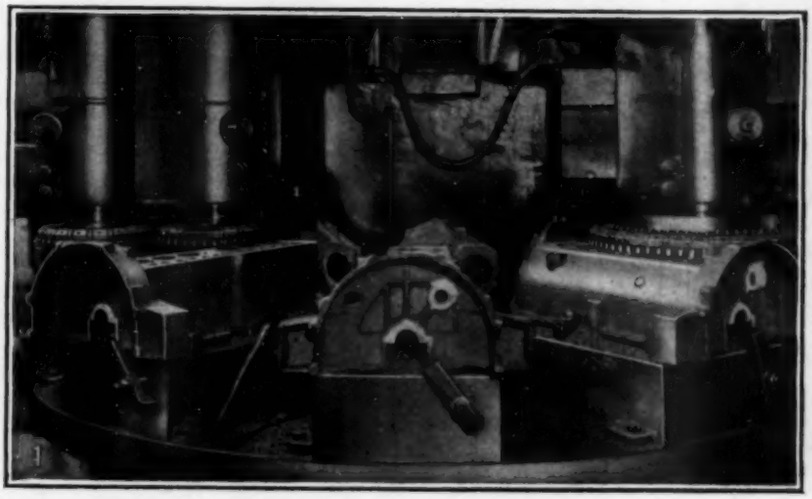
The crankcases are drilled in much the same way as the cylinders and heads, except that only one is drilled at once. The fixture is double and allows loading while one is being drilled. The type of fixture is the same, with large pillar guides and a spring-mounted bushing plate. Fig. 2 gives a good, general idea of the operation. Two holes, at opposite corners, are reamed for locating holes.

One end of the crankcase has arms for supporting the motor on the frame, as well as for the clutch housing. The other end carries the timing sprockets and the chain case. Both ends are machined at once in a rotary, drum-type Newton machine as in Fig. 3. The cases are located by the two reamed holes, at opposite corners, as can be seen at *A* and *B* The open washers *C* make it easy to load and unload the machine while the drum is in motion.

A double spindle Cincinnati machine, Fig. 4, is used in milling the ends of the crankcase arms, or supports. They are milled to the right length to go between the frame, and also to leave a shoulder at the top to take the stress from the frame bolts. Both arms are milled at once, making a very rapid operation, since it is necessary to clamp at one point only.

A somewhat unusual operation is the milling of side clearance for the connecting rods, at the bottom of each bore. This is done with the special milling head in Fig. 5. The body of the head is oblong, with rounded ends, and carries two cutter spindles, one at each side. The spindles are driven by a central bevel pinion on the drive shaft that meshes with bevels on the upper ends. At the lower end is a guide *A* that fits the cylinder opening in the crankcase, and, when fed to depth, the cutters *B* and *C* cut out the necessary rod clearance

The fifth article. The sixth will appear in an early issue.



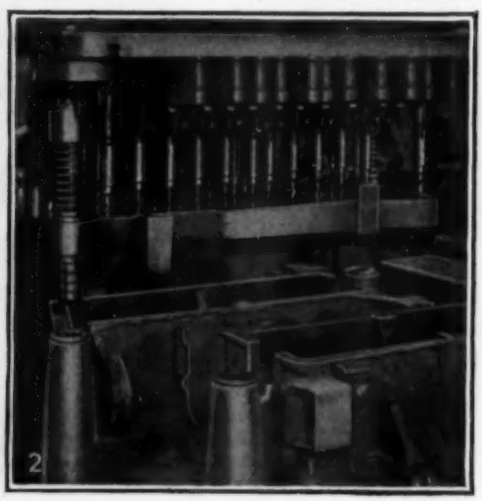
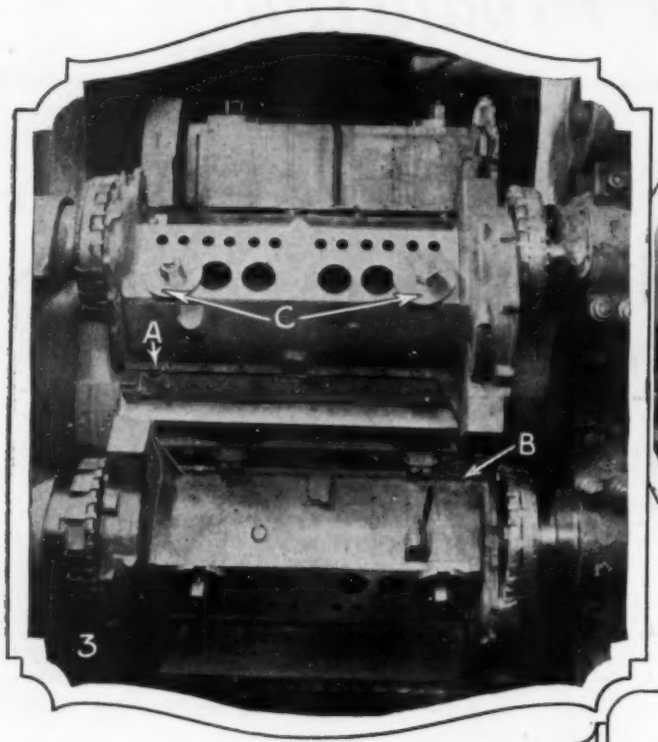


Fig. 1—Rough and finish milling of top face. Fig. 2—Drilling bolt holes for oil pan

Automotive Production



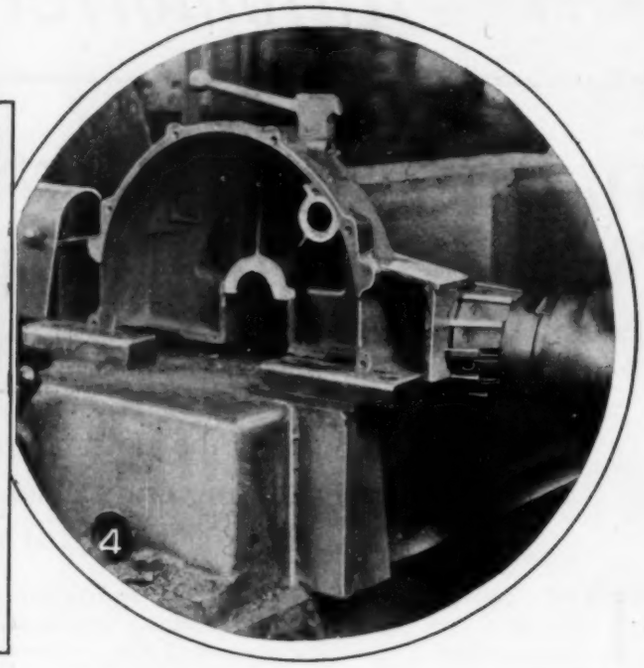
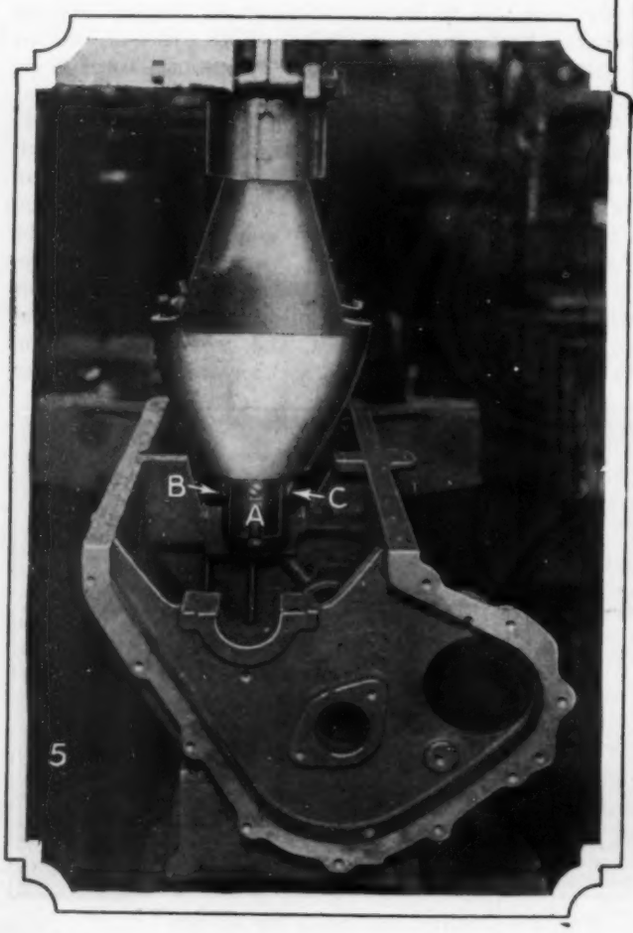
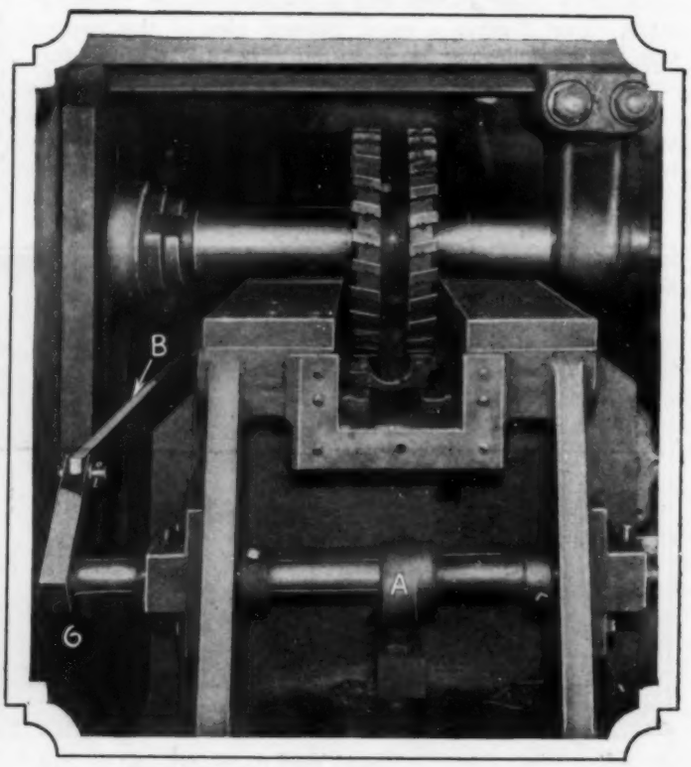


Fig. 3—Milling both ends on rotary machine
Fig. 4—Facing ends of engine supports
Fig. 5—Milling clearance for connecting rods
Fig. 6—Milling for main-bearing cap seats





Automotive Production

on each side. Since there is very little metal to be removed, the operation is quickly done.

A good example of a box-type fixture is seen in Fig. 6, with a crankcase in place. The case is raised against the upper part of the fixture by the cam at *A*, and is located by the reamed holes as before. There is a cam at each end of the fixture, connected by the arms and

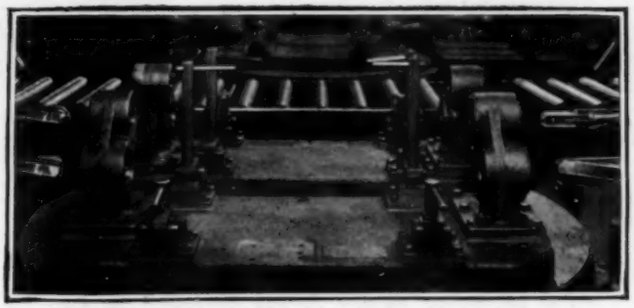


Fig. 7—Fixture for line reaming crankshaft and camshaft holes

cross bar *B*. With the case in position, the pair of cutters shown mill out the seats for the bearing caps. The solidity and rigidity of the fixture insures an accuracy that is very desirable in securing proper alignment of the crankshaft bearings.

The boring and reaming of both the crank and camshaft bearings are done in the fixture in Fig. 7, on a double-ended Rockford boring machine. The cases are located on dowels, and clamped by the flanges, using the clamps shown. The boring is done from each end, through the well-supported bushings shown, and then line reaming follows, to insure proper alignment before assembly. The long-shanked wrenches aid in tightening the clamps between the crank cases. These wrenches stay in place and both the bolts and the handles can be easily reached.

Used Car Problem In Europe Serious

Because of the increasing tendency of foreign users of American cars to trade in their cars for new models, the secondhand-car situation abroad is becoming more and more comparable with that existing in the United States, according to the Department of Commerce. In order that American automobile manufacturers may be advised as to developments in this regard, a recent questionnaire submitted to the foreign representatives of this bureau and to certain consular officers of the State Department had embodied in it a question covering the used-car situation.

In Belgium the situation is serious in that old open cars are being turned in for new closed machines and there is no market, to speak of, for touring cars or roadsters. In the Netherlands the case is similar and because of competition dealers are sacrificing nearly all or all of their commissions in making allowances on old cars.

In Poland the used car market is temporarily active because the hard times are forcing many owners to dispose of their cars and those that are on the market for automobiles cannot afford to pay for new ones.

Abstracts

from other publications

Automatic Arc Welding

Electric arc welding is being extended to include propeller shafts, frame joints, cross tubes, rear axle housings and truck bodies. In several cases automatic machines have been developed for the work and electrodes are used from 200-lb. reels instead of sticks, making a considerable saving. From 45 to 70 shafts are welded per hour, using 22 volts at the arc and 150 amperes.

No beveling or other preparation has been found necessary. Housings are given an 80,000-ft.lb. torsion test. Arc welded truck bodies stand the shocks and abuse of road service unusually well. This welding is done by hand at 30 ft. per hr. for longitudinal and 25 ft. per hr. for circular seams.—*Automotive Industries*, June 24, p. 1092.

Engine Overhauling in Fleet Maintenance

The question of engine overhauling has assumed greater importance in fleet maintenance principally because of the reduced cost of engine production and the flat-rate system of charges for repairs. The tendency now is for operators to provide a system of inspection and preventive measures to forestall failures and to defer overhauling.

In the shops of the Associated Oil Co., San Francisco, Calif., the sequence of operations is dismantling, cleaning, inspection, estimating, assembling, running-in, testing and final inspection. Of these, reassembling is the most extensive operation and is subdivided into cylinder grinding, valve and valve-seat renewals, bearing work, crankcase aligning, and general renewals and repairs where needed.

About eighty-five per cent of all cylinder reconditioning is done by grinding. Grinding the cylinders while hot water circulates through the cylinder jacket has advantages. Cast-iron pistons should have a clearance of about 0.001 in. for each inch of the diameter of the piston.

The tendency of pistons to score near the wristpin holes when the engine has been returned to service can be offset by immersing the assembled piston in a hot oil bath just before the piston is replaced in the cylinder. Plain piston rings, when carefully fitted in accurately machined grooves and having a wall pressure of 7 lb., give satisfactory results. Most shops use an oil-seal ring in the lower ring groove.

Valve grinding is often overdone through the use of improper tools and unsuitable abrasives. The tendency is toward the elimination of grinding by the use of valve-seat reamers and guides. Little has been done toward the replacing of valve seats, but many shops rebuild worn seats by the electric-welding torch. Care must be used, however, to prevent distortion of the block because of the heat developed during the welding. —W. S. Penfield, in *The Journal of the S.A.E.*, Aug. 1926, p. 183.

Pet Economies That Cost Money

By John R. Godfrey

OLD man Johnson was in a talkative mood when I dropped in to see him the other day. Not that this is an unusual condition, but he'd been off on a trip that included visiting a few shops—as that's how he gets a lot of fun out of life.

"You know Godfrey, the more I go around the more I wonder why the mortality of businesses is so low. When I see the fool notions of so many alleged managers, and how they lose money every day by following some particular line of thought, I don't see why the bankruptcy court isn't swamped all the time. I've run across several kinds of one-track minds this trip, and I always wonder how they got their jobs and how they hold 'em.

"There's the so-called manager whose idea of economy is to save on light and heat. 'Let the men move around faster and they'll keep warm' is his motto. But you know how it works. You remember the old shop, Godfrey, where it wasn't over 45 deg. on a Monday morning in winter. You remember how cold the toolpost wrench was, and everything else you had to touch? 'Course you do. And how much work did we do until the shop warmed up along about 10 o'clock? Darn little, Godfrey, darn little. And it's worse today because men are more insistent on being comfortable.

Good Lighting Is Economy

"It's much the same with lights in the shop. The boss sees the electric light bill only, and not the production or accuracy. We don't any of us realize how much more light we get from the sun, even on the shady side of the street, than in our best lighted shops. Shops that increase their light in the right way, increase production at the same time. They also increase their accuracy. In fact some of them find they simply can't get the kind of work they demand unless they give better light in the shop, and more of it. Of course, it cost more money for current, but the cost is insignificant compared to the saving.

"I ran across another sort of bird too, the kind who thinks he's keeping his shop up to date because he paints his machines and doesn't let them get too badly out of line. 'Pay three thousand dollars for a new milling machine. Not while the old one will run and not do the work too badly.' Some of 'em can't get into their heads that there's only one thing that really counts —and that is the *net* at the end of the year. Saving a thousand dollars and losing five thousand isn't my idea of being a business man, but it seems to get by with a lot of them.

"But about the worst example I found was the man who has a fixed idea about overhead. Cutting down overhead was his favorite indoor sport. And on the face of it, it's a commendable ambition. We've had overhead preached at us on all sides till you'd think it was the one great evil of the twentieth century. But there's overhead and overhead. There's overhead that is a dead loss and overhead that pays big dividends. We talk about overhead as we do germs—and yet we shoot a man full of certain germs so as to counteract others, and count it as a great advance in medicine. In the same way we can inject a liberal dose of the right kind of overhead into a busines and make it pay dividends.

"This particular excuse for a manager had the idea that management meant keeping the overhead below a hundred and fifty per cent, because some one had told him that was the right figure. Just why, he didn't know—and net results were a secondary consideration.

"The shop equipment was antiquated and the methods matched it to a Tee. Wasn't a discord anywhere—the whole shop might have been labeled 'vintage of 1873' including the manager. In a moment of aberration, he hired an engineer to improve the methods and reduce costs, forgetting about overhead for the time being. He got interested in the work and congratulated himself on being progressive because he saw machines turning out more work, saw the work going together without a hitch, and found the costs were coming down in a mighty pleasing manner. Machines that had cost thirty-seven dollars to build were being produced for twenty-five, with almost no expense for new machines.

"He was patting himself on the back, so to speak, when his cost accountant submitted a cost sheet that showed the overhead had gone up over the 150 per cent line. That busted up his dream of economy. No matter how much he was saving in dollars and cents, he must be losing money if his overhead bobbed up over the dead line. So he fired the engineer who had made the savings to cut down the overhead and his heart took up its old job again. It had stopped short at sight of the overhead.

"Godfrey, when I think of men who really help our efficiency as a nation, being at the mercy of men with a one-track mind like that, it makes me understand why men see red, or at least pink, at the way we run things. And there isn't any answer that I know of. Some day, this manager will get fired for incompetency, but that won't help the engineer a bit.

"Now don't think that I'm advocating increasing overhead just for the fun of it. I'd rather see it go down than up any day. But we call a lot of costs overhead that ought to go into production, as in this case. The more we do work by machine, the less direct labor costs per piece, and very frequently the machine overhead goes up. But that doesn't mean that we've increased costs.

"There's a lot more I could say about this, Godfrey, but I won't—but if you can start some of the men who think they are managing our industries, to see that all direct labor isn't the only thing that really makes up the cost of actual production, you may have an excuse for some of your stuff."

A Toolcrib Elevator

By I. B. Rich

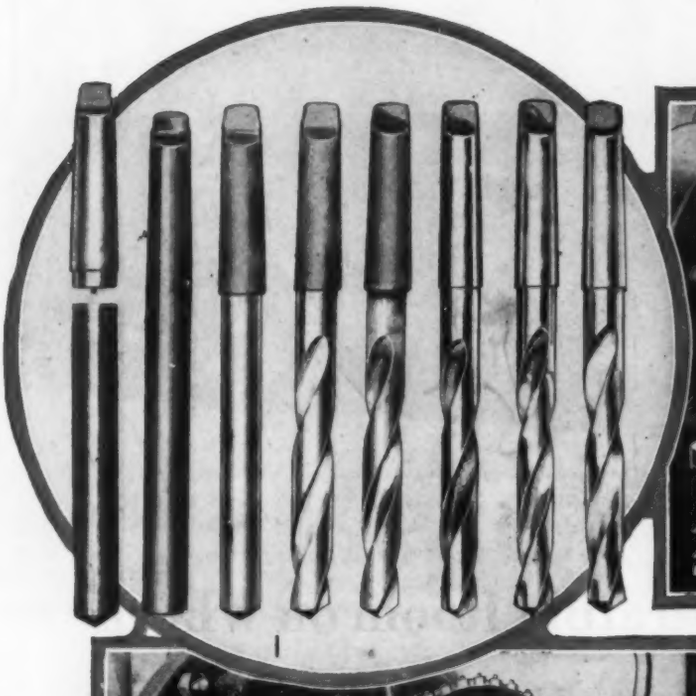
One of the factors in preventing, or at least of reducing, the idle time of machines is to provide a method of getting the tools and fixtures from the tool crib to the workmen. Many methods for transporting tools have been tried, including having the operator go to the tool crib, employing a messenger boy, and even to using pneumatic tube carriers.

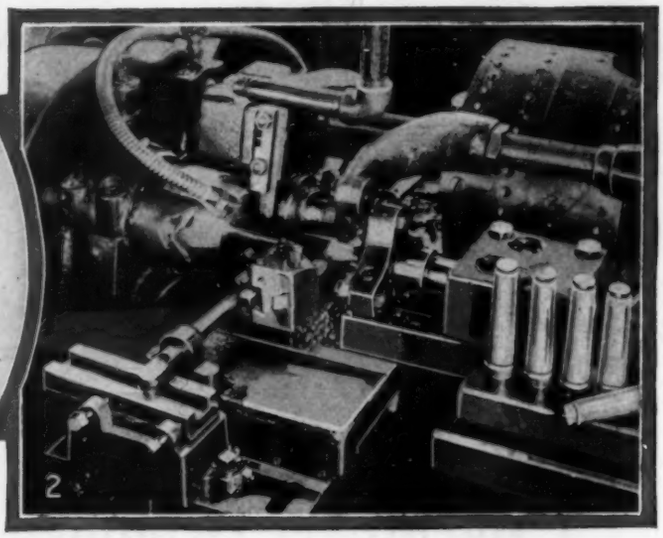
For cases where the tools must be carried from floor to floor, the old box and rope that passed for a dumbwaiter has given way to a small electrically operated elevator of the automatic type, such as is used in small apartments and office buildings. A device of this kind was recently seen in the shop of the Warner Elevator Co., Cincinnati, Ohio.

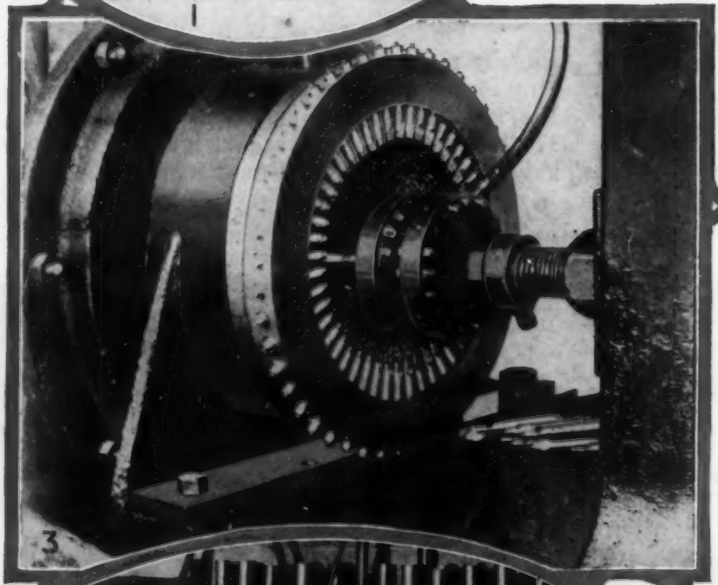
A Machinery Demonstrating Room on Wheels

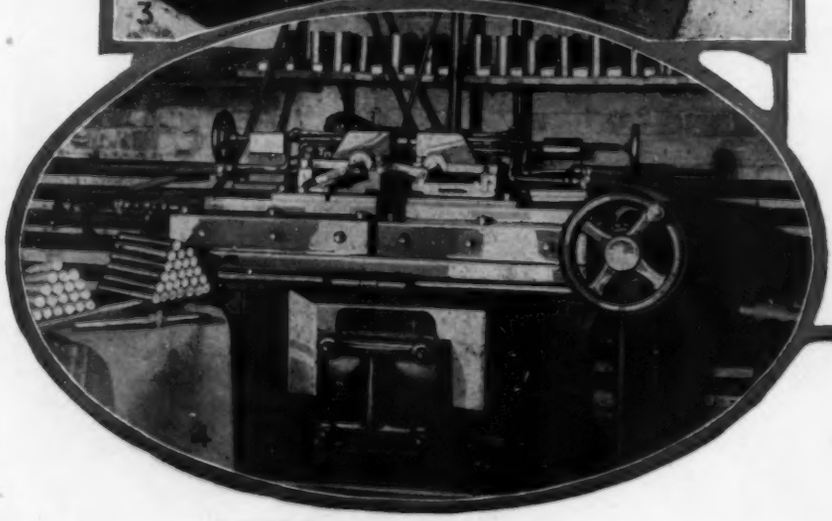
The new demonstration car of J. D. Wallace & Co., Chicago, will be used for calling on all classes of prospects and for educating jobbers' salesmen in the fine points of their line of portable woodworking machines. The tools are all individually motor driven, 110-volt alternating current coming from a generator mounted on the Reo bus chassis that carries the whole works. The round object at the upper right is a bandsaw guard and not a spare tire.

Steps in the Manufacture









1—Stages in the manufacture of a high-speed drill

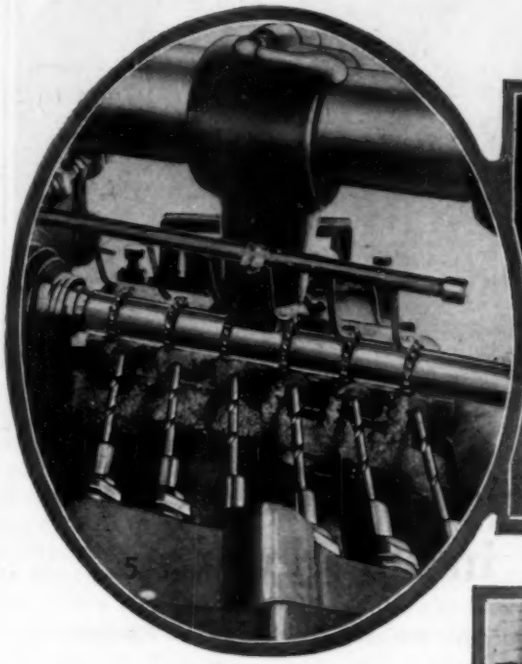
2—The mild-steel shanks are turned from the bar in an automatic machine

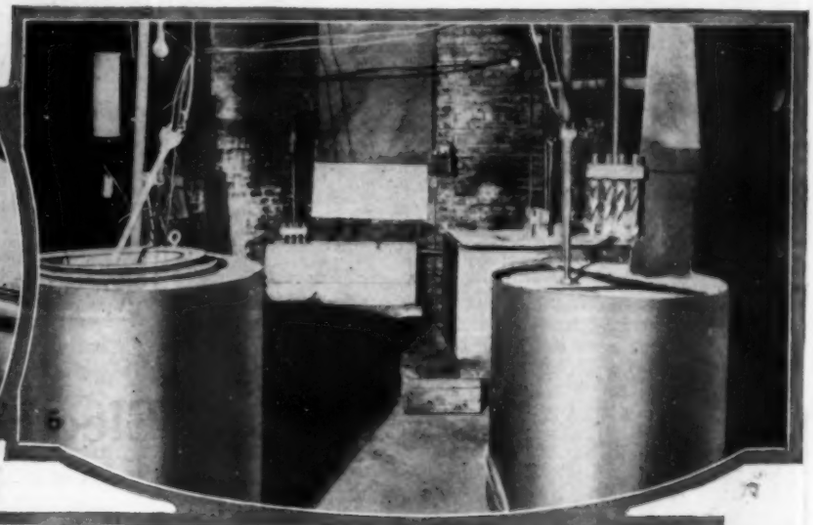
3—The tangs are milled on the shanks in a revolving fixture. The shanks fit into taper holes, the small ends protruding toward the center. The fixture is offset from the machine spindle so that the cutting is done at one side. The quantity of shanks held in the fixture depends on their size

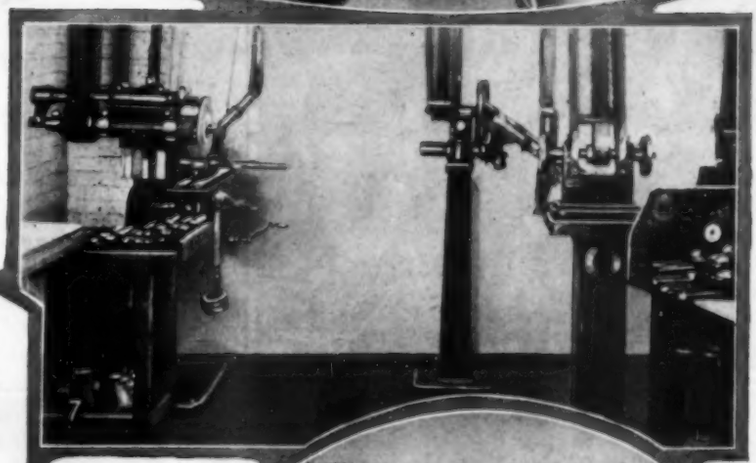
4—The mild-steel shanks are electrically welded to the high-speed steel bodies. It is important that the clamps in the welding machine center both parts very accurately.

Photographs by courtesy of the

# of High-Speed Twist Drills







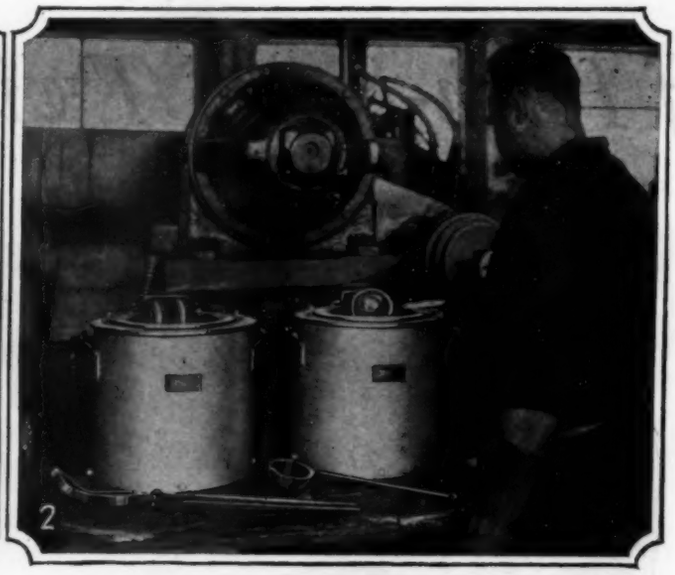
5—In milling the flutes, 6-spindle machines are used for drills up to 1 in. in diameter, and 3-spindle machines from 1 to 2⅛ in. Larger drills are fluted in single-spindle machines.

6—Heat-treatment requires that the temperature be controlled with great exactness, therefore the baths and furnaces are equipped with pyrometers

7—After heat-treatment, the drills must be relieved, pointed and the flutes polished

8—The final machining operation is grinding the drills to size. In this view drills of many sizes ready to be ground, are shown. After grinding, each drill must pass a rigid inspection.

Down Tool Works, Inc., Fleetwood, Pa.



Electric Heating Devices in the Shop

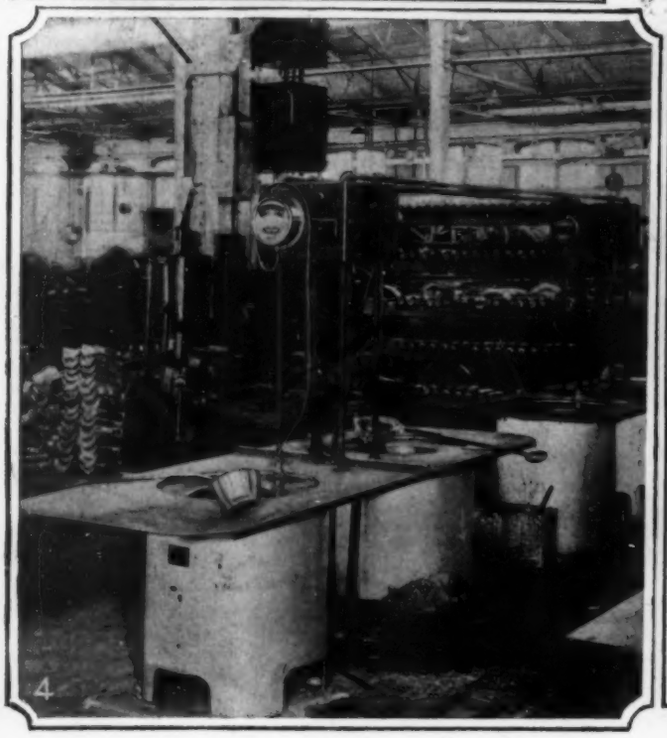
1—Hot plate for drawing tools—General Electric Co.

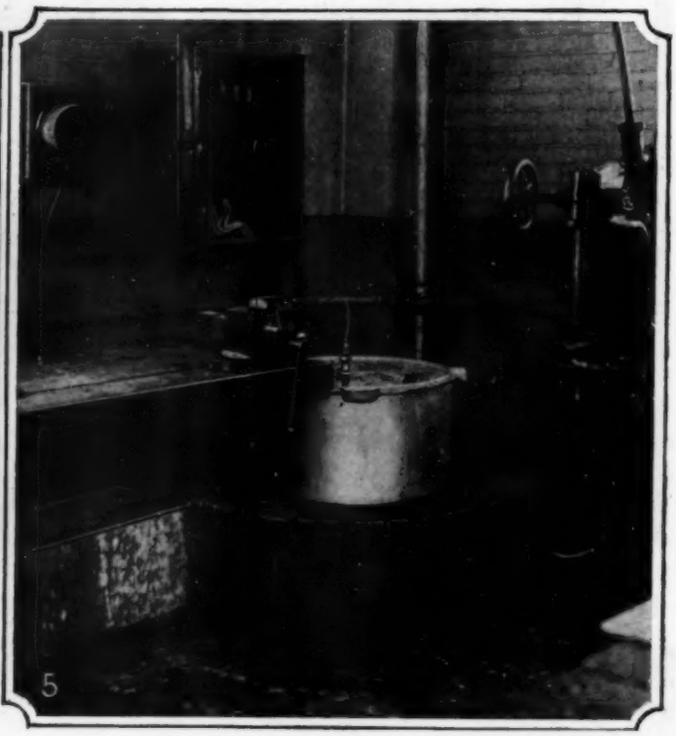
2—Two metal melting pots—General Electric Co.

3—Lead pots for heating axes—Westinghouse

4—Standard, 750-lb. babbitt pots for railway bearings—Westinghouse

5—Melting pot for tinning cable ends—Westinghouse





Solving a Helical Gear Problem by Unconventional Methods

By Earle Buckingham
Associate Professor of Engineering Standards and Measurements
Massachusetts Institute of Technology

Selection of the change gears without the use of continuous fractions—Calculation of the theoretical pitch radius for the hob and the root radius of the gear

THE following problem recently arose in regard to the cutting of a pair of right- and left-hand helical gears: Required two equal gears 8 pitch, 20-deg. pressure angle, 4-in. face, about 14-in. pitch diameter, and with 82 or 83 teeth. The helix angle is to be just large enough to produce a smooth contact without much end thrust. A single-threaded right-hand hob is available for cutting both gears in a Rhenania hobbing machine with a constant of 24. Four gears are used in the change-gear train, each having less than 100 teeth, and four feeds are available: 0.02, 0.03, 0.04, and 0.06 in. per revolution. The change-gear formula is

$$\frac{A \times C}{B \times D} = \frac{\text{Lead} \div \text{Feed}}{(\text{Lead} \div \text{Feed}) \pm 1} \times \frac{24}{\text{No. of teeth}}$$

for the respective gears.

There are many features of the involute, particularly when applied to helical gears, that are not fully appreciated, and which, when full advantage is taken of them, greatly simplifies many of such problems. It would take a book in itself to expand fully on this point, so I shall confine myself to statements of fact without attempting to give their proof.

In the first place, two helical gears cut with the same hob and having the same number of teeth must have the same lead. This is the only essential. The exact lead does not matter. The gears can be cut deeper or shallower as required to have them mesh at the required center distance with the desired backlash. Their actual running pressure angle may be more or less depending upon the center distance, but their action will be correct.

In the second place, the angular setting of the hob has no effect on the form of the tooth produced except in the height of the fillet at the root of the tooth. A change in angular setting will change the thickness of the tooth but not the profile of the involute.

Under these conditions, it is not necessary to struggle for exact leads for such an equal pair of gears. In this example we will make the lead exactly 200 and see what we get.

Let number of teeth = 82
Feed = 0.040 in.
Lead = 200 in.

Whence we have

$$\frac{5{,}000}{5{,}001} \times \frac{24}{82} \text{ and } \frac{5{,}000}{4{,}999} \times \frac{24}{82}$$

4,999 is a prime number. What we are really searching for is three consecutive numbers about 5,000 that can be factored. Also, as but two pairs of change gears can be used, the middle figure must have 41 as a factor. The nearest numbers we find are the following:

$$5{,}083 = 13 \times 17 \times 23$$
$$5{,}084 = 2 \times 2 \times 31 \times 41$$
$$5{,}085 = 3 \times 3 \times 5 \times 113$$

This requires a change gear of 113 teeth which is probably special. The next nearest numbers with factors less than 100 are the following:

$$4{,}345 = 5 \times 11 \times 79$$
$$4{,}346 = 2 \times 41 \times 53$$
$$4{,}347 = 3 \times 3 \times 3 \times 7 \times 23$$

This will give a shorter lead or a higher helix angle. The change gears would be as follows:

$$\frac{53 \times 32}{84 \times 69} \text{ and } \frac{53 \times 24}{79 \times 55}$$

Another set of numbers which would give a larger lead, or lower helix angle, would be the following:

$$5{,}780 = 2 \times 2 \times 5 \times 17 \times 17$$
$$5{,}781 = 3 \times 41 \times 47$$
$$5{,}782 = 2 \times 7 \times 7 \times 59$$

These change gears would be as follows:

$$\frac{47 \times 36}{98 \times 59} \text{ and } \frac{47 \times 45}{85 \times 85}$$

Of these solutions, the last is probably preferable. We will now determine the nominal setting angle of the hob, the lead or helix angle of the gears, and the depth to cut. The lead in the last solution is equal to 5,781 $\times$ 0.040, which equals 231.24 inches.

When r = radius of pitch circle of gear for setting hob
H = helix angle of gear
L = lead of gear
n = number of teeth = 82
CP = circular pitch of hob = 0.5236 = $\frac{\pi}{6}$

Then
$$\tan H = \frac{2\pi r}{L}$$
$$2\pi r = \frac{n \times CP}{\cos H}$$

Whence,
$$\tan H = \frac{n \times CP}{L \cos H} \quad \text{or} \quad \sin H = \frac{n \times CP}{L}$$

Thus we have,

$$\sin H = \frac{82 \times 0.5236}{231.24} = 0.18567$$

$$H = 10° - 42'$$

$$r = \frac{n \times CP}{2\pi \cos H} = \frac{82 \times 0.5236}{6.2832 \times 0.98261} = 6.9543 \text{ in.}$$

We will now deal with a section of these gears perpendicular to the axis, and treat them as spur gears. We will therefore determine the form of our basic rack in this section. This will be the section of a ½ pitch, 20-deg. rack at an angle of 10°–42′. The tangent of the pressure angle in this section is equal to

$\frac{\text{Tan } 20°}{\cos 10°–42'} = 0.37041$. Whence $a_1 = 20°–19'–30''$

The circular pitch of this basic rack is equal to $\frac{0.5236}{\cos 10°–42'}$ which equals 0.53286 inches.

From Problem 10 in the eighth article of my series, "The Design of Gear Tooth Forms," on page 595, Vol. 64, of the *American Machinist* (April 15, 1926) we know that the tooth thickness of these gears should be one-half the circular pitch on a 7-in. radius. Whence

$F = 0.1875$ in. (same as dedendum of a ½ pitch gear)
$=$ nominal addendum of rack

$N = 82$ teeth

$$\cos a_2 = \frac{r_1 \cos a_1}{r_2} = \frac{6.9543 \times 0.93774}{7.0000} = 0.93162$$

$a_2 = 21°–18'–30''$

$G =$ distance from center of gear to tip of rack

$$= r_1 - F + \frac{\cot a_1}{2}\left[2r_1\left(\frac{T_2}{2r_2} + \text{inv } a_2 - \text{inv } a_1\right) - \frac{CP}{2}\right]$$

[Equation (48)]

$$= 6.9543 - 0.1875 + 1.3494\left[13.9086\left(\frac{0.2681}{14} + 0.01814 - 0.01566\right) - 0.26643\right] = 6.8133 \text{ in.}$$

Thus the root radius of the gears, without backlash, will be 6.8133 in. Backlash can be secured by cutting slightly deeper.

We would now have the following specifications for this pair of gears:

Pitch of hob	½
Pressure angle of hob	20 deg.
Pitch diam. of gears	14 in.
Face	4 in.
Number of teeth	82
Outside diameter	14.250 in.
Root diameter	13.627 in.
Setting angle for hob	10°42′ plus and minus helix angle of hob
Lead of helix	231.24 in.
Change gear ratio	$\frac{47 \times 36}{98 \times 59}$ and $\frac{47 \times 45}{85 \times 85}$

The actual helix angle of these gears would be somewhat different than that for the hob, but this is of no importance as the helix angles on both gears will be alike. As a matter of fact, the correction in the depth setting of the hob in this case is only about two thousandths of an inch, and could have been ignored. This is always true when the tooth numbers are large, over 50, for example. I have figured it through, however, to show how the spur gear data can be also applied to such gears.

This explanation may seem like a round-about process to arrive at an answer. It is not, however, once the method is understood. The explanation makes it seem longer than it really is. At best, however, considerable figuring is necessary in such cases.

To summarize this method, the steps are as follows:

1—Determine the lead in the usual manner as a starting point.

2—Select the nearest (preferably larger) series of three consecutive and factorable figures that represent the gear ratio where the middle figure contains a factor of the tooth number. This can be quickly done with a complete factor table.

3—Determine the tooth number of the change gears from the selected numbers.

4—Determine the actual lead of the gears by multiplying the middle selected number by the feed.

5—Determine the helix angle of the hob from the actual lead of the gears.

6—If the tooth number of the smallest gear is fifty or larger, establish the tooth proportions without regard to the altered position of the hob, as the correction for tooth thickness, which is the only factor involved, will be very small. If the tooth numbers are small, this should be figured through as shown, else excessive backlash may be present.

In this case we have dealt with a pair of equal gears. In other cases, with different tooth numbers, the process would be the same except that the leads should be directly proportional to the tooth numbers.

This method has the advantage of being theoretically correct, whereas the use of continued fractions to get an approximation introduces a difference in the helix angles of mating gears, the amount of this difference depending upon the closeness of the approximations.

Reason vs. Threats—Discussion

BY A. C. KELLEY

The defense of the threatening shop sign by J. Homewood on page 943, Vol. 64, of the *American Machinist*, seems to me to be a last stronghold battle for a custom that is rapidly going out of practice in the shop. I am inclined to agree with G. B. Stewart's appeal for the final abolishing of this type of shop notice.

It appears like a platitude to say that the notice is not considered a message to the whole force. The fact that the threatening sign is hanging over the heads of the entire force day after day is enough to stir up a feeling of revolt even in the humblest. There is nothing that makes a man rebel more effectively than the continual reminder that he will be severely punished for doing a thing that he considers a slight fault rather than a serious crime.

I have been connected with a number of large manufacturing plants, and my experience is that the scare signs are rapidly going out. If a workman thoughtlessly breaks a shop rule, a call-down is usually all that is necessary to make him keep it in mind the next time. But where a man persistently breaks a rule and is discharged, all of his shopmates get full details through "old lady gossip," and the effect is better than the threatening sign always hanging over the loyal man.

Old and New Machinery in China

By Frank A. Foster

British and German machines predominate — Cost of American machines generally prohibitive—Man power still used in small shops—Types of cupolas for melting iron

MACHINERY is taking the place of the old, hand method of production in almost all the important industries in China. It indicates that China is trying to catch up with the procession, and while it may be a comparatively small beginning yet it is very significant.

One does not have to travel far to come across the old methods still being plied patiently and industriously. Often the old and new are side by side. Some of the old equipments are identical with those in use a thousand years ago or more. In fact, the Chinese of bygone ages were very ingenious mechanics and engineers for their generation. They learned how to accomplish a great deal of useful work with very little apparatus. They were apparently up to the most advanced methods of their times, and were, perhaps, the leaders in many of the arts and manufacturing processes. A good illustration of this phase is their successful development of the art of producing iron, and their ingenious methods of casting it. Iron articles produced by them in very ancient times, show a high degree of skill and ingenuity, but the present-day methods are behind those of some other nations.

> Whatever the attitude of the Chinese in the past may have been concerning the progress of the rest of the world, the younger generation has awakened to many of the advantages to be derived from the adoption of many of the foreigner's goods and the methods used in producing them

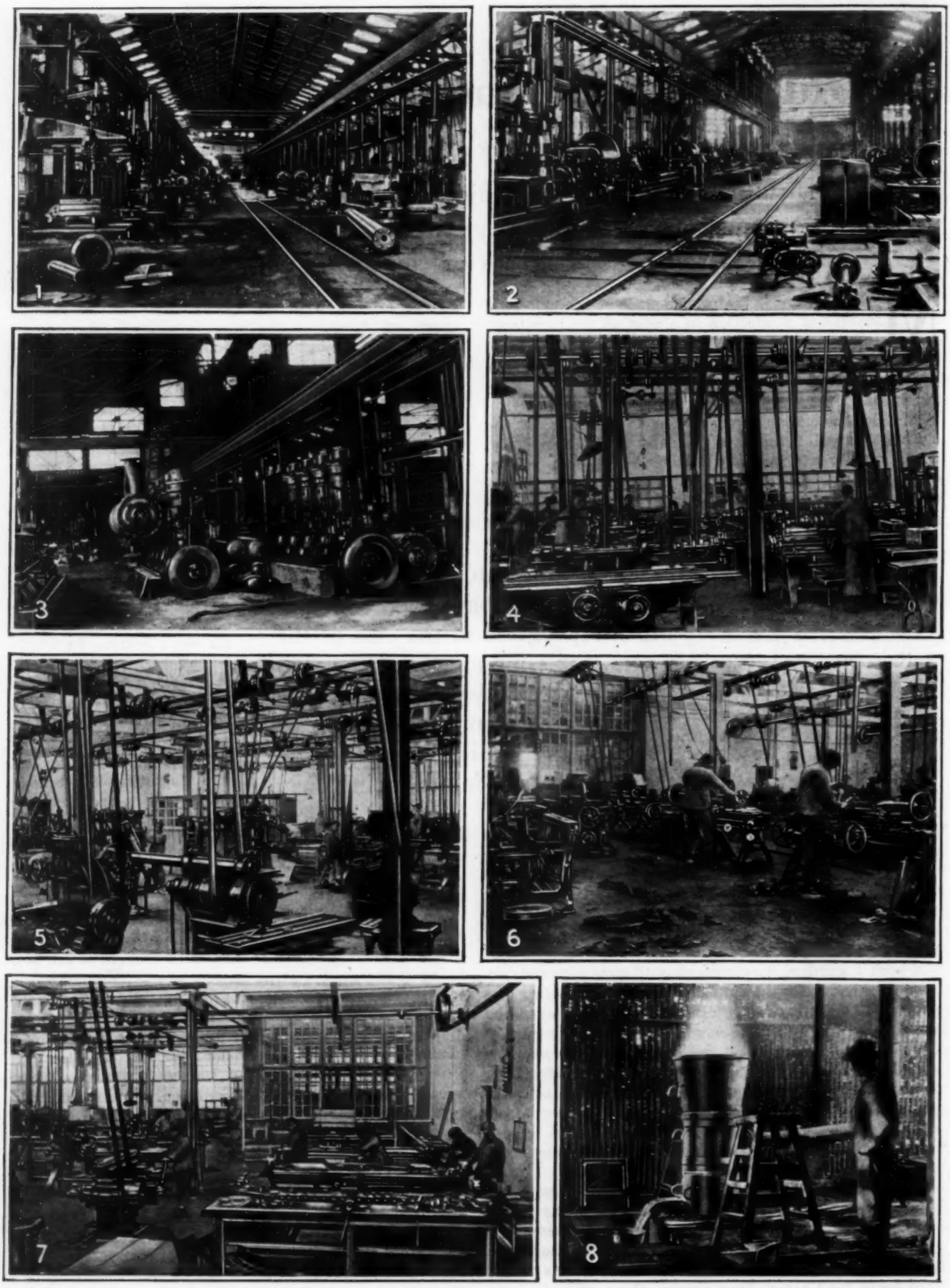
The advent of manufacturing by modern methods has created a demand for modern machine tools, by which machinery can be made and repaired. There has been a gradual development until now a variety of machines are made in China to meet the growing demands of the industries. The writer has observed the building of the following kinds of machines in purely Chinese shops: steam and gas engines, textile machinery, flour mills, hydraulic presses and other machinery for extracting vegetable oils, hoisting engines, printing presses, machine tools of all the more common types, electric generators and motors, steam pumps, steam boilers, steamboats and ships, woodworking machinery and many special purpose machines.

The equipment of Chinese machine shops has been influenced by the Germans and English for many years. In the past few years American machine tools have been coming in more and more. The generally higher price for the better grades of American tools is one factor that keeps the Chinese from buying them. The Chinese pocketbook nerve is quite sensitive, and in many cases the determining factor has been price, and a more general experience with the European types. Naturally where an American machine is wanted, the one of cheaper grade is apt to get the preference, regardless of real worth. This does not mean that really first-class American tools do not get in here, for they do, but too often the inferior grade of tool is selected without really knowing the essentials. The Chinese have not learned to discriminate carefully in such selections. There are some shops here, however, that are under American management and through them some very good American equipment has been introduced. Such installations are good object lessons to the Chinese, especially to those who have a chance to use them. Quite a number of good American machine tools that were intended for Siberia and Russia were held up in Vladivostok during the war, and eventually found their way to Chinese ports and were sold at very attractive prices.

Shanghai is the largest manufacturing center in China. There are numerous textile, flour, and oil mills, a large cement works and hundreds of machine shops of all grades, from the little room equipped with an upright drill, a lathe and perhaps a planer (all driven by man power) to the large plant turning out textile machinery, electric motors or Diesel engines. Electric power is on sale in Shanghai at so reasonable a price that a great many of the larger mills and shops are now using it for their driving power.

The Kiangnan Dock & Engineering Works is a good example of the large shops engaged in metal work. While this shop is owned by the government, it is operated under foreign supervision. It has facilities for making everything required for large ocean or river vessels, either steam or motor driven. It has built several large transports and is now starting on a new contract for several river gunboats for use in Chinese waters. A few foreigners are employed as foremen of the more important departments, but all the skilled workmen are Chinese. The foundry of this shop is equipped with an American type of cupola but for ordinary runs of work the Chinese type of cupola is used.

A high-grade milling machine of one of the best American makes is to be found in this shop although the greater part of the heavier tools are of European origin. The designer and mechanical engineer of this company is Chinese and had had his training in a



Figs. 1 to 3—In the Kiangnan Dock and Engineering Works. Figs. 4 to 7—In the shops of the China Machine Company. Fig. 8—A Chinese cupola

Chinese technical school, but some of this training was under an American teacher, and the school had received a very liberal donation from a well-known American machine tool concern. He naturally had a preference for good American tools when it came time to secure a new milling machine for his shop.

The general preference of the average Chinese machinist is for a rather heavy gap lathe, suitable for a wide range of work. This demand has been met largely by European lathe makers and the lathes have been copied to some extent by local Chinese makers.

Most of the larger machine shops have their own foundries. In a large majority of them the melting is done in Chinese cupolas. The smaller sizes of cupolas are mounted on trunnions and are tipped to pour off the melted iron. This type of cupola consists of a bowl-like base mounted on trunnions. On top of the base is mounted a cylindrical section, three or four feet high with a tuyère hole in the side, directing the blast downwards. The larger type is made by using two sections, instead of one, mounted on the base bowl. This type does not tip, but is tapped in the same manner as an American cupola. The first charging is done by laying the first fuel in the bowl and then luting the first section onto the top of the bowl and laying in the various layers of fuel and coal, then luting on the second section and filling that in the same way. After the fire has been started, the further charging is done by tossing in the various materials from a movable platform. The tuyère in this type is at the back of the cupola, and the pipe is supplied with a removable cover which permits the charge to be poked down as may be necessary. Coke is used as fuel.

Poor Quality Castings

The Chinese do not, as a rule, get as good castings as would be turned out by an American foundry. There is a tendency not to vent the molds sufficiently, or to give proper consideration to the other causes for blow holes. A loss of as high as 30 per cent in poor castings from a day's run, is reported by some foundries. In foundries that make a specialty of some one product, the molders naturally get more skillful and the losses are much smaller, but where the output is varied from day to day, the losses are apt to run pretty high.

While modern machines are coming into use quite rapidly in China, it should be noted that some of the older types are still to be seen doing their work by the side of the new. Many of them are the same as used centuries ago, not only in China, but also in other countries. Whether these older types originated in China, or not, is hard to determine now, but there is much evidence to show that the Chinese led the world in many of the arts in the old days, and had a strong influence on the neighboring peoples.

Manufacturing was, and still is, carried on in small units with local or home-made tools and machines, which, in some instances became adopted over quite large areas. Animal power was employed in some of the heavier operations. Hand and foot power was used where possible, man power being very cheap. Water power was used to good advantage where water was abundant and the fall sufficient.

Files are very ancient tools, extensively used by the Chinese. They cut them by hand, usually in small local shops, employing a few men and boys. One man holds the chisel for cutting the teeth while another strikes rapid blows with a hammer, the chisel being shifted a tooth at each blow. These operations are often carried on in little booths at the side of the street or in the open air.

The advent of so much new machinery causes a demand for skilled mechanics and an effort has been made to give young men some school training in mechanics and allied subjects, coupled with practical shop work. These schools have not been able to give as good or thorough training as in American schools, but the fact that they have recognized the importance of such training is a good step in advance.

China is undergoing a very critical and trying transition from old conditions to new, politically and economically, but in spite of the unsettled conditions, the volume of business done and the demand for modern manufacturing equipment increases surprisingly. While it may make more of its own machinery in the course of time, the contact with foreigners and modern ideas and foreign goods is creating a demand that will call for much larger exchange of commodities with the outside world.

The Trend of Apprentice Training

By Frank C. Hudson

Apprentice training continues to be a subject for discussion and experiment. A brief survey of thirty-five cities, well scattered as to location, shows a widespread interest on the part of both educators and employers.

Employers who have studied the work of modern trade schools, and extension or part-time schools, are convinced that such schools can be very helpful in many ways. There seems to be little doubt as to their being able to give much of the preliminary training in the handling of machines and to teach the whys and wherefores of shop work. This is just the training that interferes most with production when it is done in the shop and for that reason, it is very apt to be given too little time and attention.

While it is believed that the schools can be of great value in teaching fundamentals, it seems that actual shop conditions are required to make good mechanics. The more nearly the schools can simulate shop conditions, the less time it will take for the boy or young man to hold his own in the competition of actual production work.

There are, naturally, wide differences of opinion as to what subjects should be taught. Some hold that the teaching should be confined to the actual shop problems that confront the boy. Others feel that he should get at least an idea of such things as overhead, materials, personnel and other factors that play such an important part in modern industrial life.

There is a marked difference in the interest shown in different sections of the country. Whether this difference indicates the comparative difficulty in securing good mechanics, or the fact that some sections require more skilled help than others, is not always clear. In one well-known machine building center, every apprentice in town attends the continuation schools. And as soon as the school facilities have been enlarged it is expected that twice as many apprentices will be employed. There is every indication that employers are aware of the need of training boys to handle the machines used for production.

THE · FOREMAN'S · ROUND · TABLE

Assigning Work to Machines

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"SAW you going in to see the big boss this morning, Al. What's up? Going to make you assistant super—or fire you?" 'Twas Ed, joshing his pal on the way home.

"Neither just yet, I guess, Ed. He was asking me if I had any notions about assigning work to different machines."

"Must think you're a walking dictionary, Al. Why doesn't the boss know all about systems—that's his job, isn't it?"

"Perhaps. But I'm glad he consults some of us before he claps in a new system. Sort of perks a fellow up to be asked about things beforehand."

"Well, what did you tell him, Al?"

"Oh, I told him of several I had seen. One system that I've noticed in shops about this size is to have a board with each machine shown by a number, with a hook in each space on which they hang orders for work to be done. When a job comes in for that machine it is hung on the hook and the number of orders on the hook shows the jobs ahead. Some use spring clips instead of hooks so they can slip the last order under the others instead of having it come on top.

"When they use the hook the operator is supposed to take the bottom card, and it works out fairly well, I'm told. It shows right away if you're piling up too much work on any one machine and helps distribute the orders where they can be handled the best."

"Tell him any more, Al?"

"Yes, I told him that I'd seen envelopes used instead of cards and that the envelopes carry blueprints and all necessary instructions. In that case there are pockets on the board to hold the envelopes. The last envelope can be placed at the back."

"Who assigns the jobs?"

"If there is a planning department, they very often say what machine to use. In some shops the foreman says what machine ought to do the work.

"There's one more point, too, Ed. Some scheme like this makes it easier to plan work ahead. The board shows the machine capacity of the shop or department and allows the work to be distributed quicker than in any other way.

"Where they have planning departments they often put down the machine hours the job should take. This makes it easier to plan ahead on the time each job will tie up the machine."

"You sure gave him an earful, Al. What did he say when you got through?"

"Thanked me, of course. Said he'd talk it over with me again before he decided what plan to use."

"You've got that assistant super's job cinched, Al. Guess I'll have to get busy myself."

How would Al's suggestions fit into your shop?
Would cards or envelopes be better for most work?
Should the planning department or the foreman decide which machine to use on the job?
What are the weak points to the systems outlined by Al?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

How Much Standby Equipment Is Necessary?

FOR the average engineering or tool shop, I believe that five per cent spare equipment would be sufficient, but for the automotive industry it is necessary to carry a reserve in equipment anywhere from fifteen to twenty per cent of the equipment that is in production. In some departments, particularly on cylinder machining and testing operations, it is often necessary to have twenty-five per cent of the equipment in reserve.

This condition is chiefly due to the fluctuation of orders and some misuse of the machinery on the part of semi-skilled and unskilled labor. In addition must be considered the tremendous speeds and feeds at which these machines frequently must operate. I have sometimes replaced the pulleys on new drilling machines with ones seventy-five per cent larger in diameter.

All means possible should be taken to prevent these breakdowns that increase the amount of standby equipment necessary. I would see that every operator oiled his machine before starting up and that at least one good cleaning be given to the machine each week.

There are two kinds of breakdown—equipment and labor. Both hold up the output. Whenever possible, all jigs and special fixtures should be designed so that they can be transferred to other machines. This should also apply to tools with taper shanks, such as special cutter bars, reamers and chucks. Wherever there is a special operation that requires unusual skill, it is advisable to break in two men.

Spare parts of all vital mechanisms should be carried in stock in the store room. This applies particularly to gears, worms, bearings, spindles and shafts.

—ARTHUR SILVESTER.

Letting a Man Try His Own Way

THIS topic comes within the field of executive psychology. When a foreman is appointed it is not that he knows more than all of the other workmen, but because the management thinks that by adaptability and personality he can sustain the required quantity and quality.

When I became a foreman, I suffered agonies of self-reproach if a subordinate out-guessed me on a job. But I found that if each workman must wait until I planned his every move, I became spread out too thin to get results.

Before giving out a job the foreman should obtain all possible information as to the requirements of the work and the available tools, and then watch that no unwitting blunder is made. The workman should look on his foreman as an advisor.

Of course we are always annoyed by the pest who wants to build an expensive jig to drill a setscrew hole, but the man who asks for a core drill in order to save boring or a height block to save time in tool setting or even asks for a chance to try it out on another machine is the friend you will need when that ten per cent lower labor cost with its corresponding reduction in overhead just beats the Blank & Co. bid.

—ROBERT B. MCLAUGHLIN.

THE · NEXT · TOPIC

Just What Is Discipline?

QUESTIONS

Which infractions of shop rules, if any, should be winked at?

Should all rules apply to everyone alike, no matter what his position?

What should be done to stop fooling or horse-play that may result in serious injury?

Where Shall We Start Apprentices?

IT IS considered today by men who have spent many years of their lives conducting apprenticeship systems, that the most efficient and economical method of training apprentices is to give them the fundamental and basic training in a specially segregated apprentice department.

The advantages of this system are:

(1) He is taught by experts. Few foremen have the ability or the facilities for giving proper instruction in training apprentices.

(2) The apprentice who is segregated does not hold up the chain of production.

(3) The training department is better able to weed out the unfit and to divert the misplaced but good material into the proper channels.

Good boys will stick if we make their training real and worth while. The foreman is usually too busy a man to devote any time to the proper training of the boy. The boy will then capitalize on what training he has received by taking a job in some other plant. Training programs usually include assembly work during the apprenticeship course and in this way the boy obtains some sense of judgment in the kinds of fits.

All apprentices should be taught the rudiments of the trade in a training department by men who are skilled in teaching. A training program should be outlined for each trade so that each and every apprentice will receive, as nearly as possible, identical training. The apprentice who has been taught the rudiments well will need but little teaching when he reaches the manufacturing departments and consequently his progress in the acquiring of skill and experience will be greater.

We start our drafting apprentices in the machine shop training room. We tried starting them in the drafting room but no improvement was found.

—D. L. GEORGE, *Supervisor of Education.*

Ideas from Practical Men

Grinding Two Surfaces at Once

BY HENRY DENSMORE

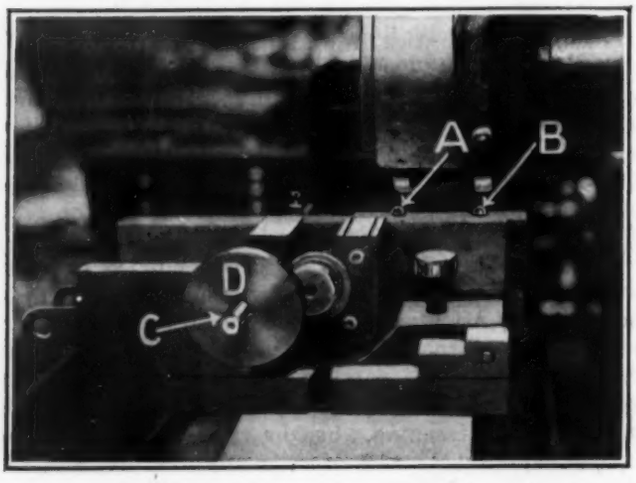
The illustration shows a fixture by which the Westinghouse Electric & Manufacturing Co., at its East Springfield plant, grinds two surfaces in exact relation to each other without delay or uncertainty. The piece shown in the fixture is one side of a magnetic brake, used in certain classes of motors, and the grinding is a production job.

The machine used is a standard toolroom surface grinding machine, on the table of which is a magnetic chuck. The fixture requires no setting up other than to place it on the chuck and turn on the current.

A sleeve on the spindle of the grinding machine carries two 6x½-in. wheels. In the fixture at *A* and *B*, two diamond truing tools are set to heights varying by the amount of height the difference in level between the ground surfaces.

The plug *C* is permanently fixed in the wall of the fixture, and the hardened disk *D* is of such diameter that when it is wrung on the plug, the uppermost part of its periphery will be in the same plane as one of the finish-ground surfaces of the work.

The fixture locates the part in correct relative position. When the wheels are passed over the truing diamonds, for which purpose the cross-slide of the machine is drawn forward, their diametrical relation is established correctly to grind the two surfaces of the work. The micrometer dial on the elevating screw of the machine is set to read zero.



Grinding with two wheels

The wheel spindle is then elevated sufficiently to allow the wheels to clear the work, the cross-slide is run back to grinding position, and the wheels are lowered while the table is traversing, until the dial on the elevating screw again reads zero.

Disregarding wheel wear, this should leave the ground surfaces of the desired height. To make sure that they are so, a dial surface-gage, is placed on the chuck and its measuring spindle is passed over the disk; the dial being set to read zero when at the highest point. Upon passing the measuring spindle over the ground surfaces, one of them should now indicate zero and the other the proper relative difference, the amount being shown directly by the dial reading.

Since the work is held to quarter-thousandth limits and because there are considerable and varying amounts of stock to be removed, the job is done in two operations. First, all of the pieces are ground to within a thousandth or so of finished height. Then they are passed through the operation the second time to finish them. In the finish grinding, where the varying conditions encountered at the start do not exist, several pieces can be ground before the wheels will need redressing.

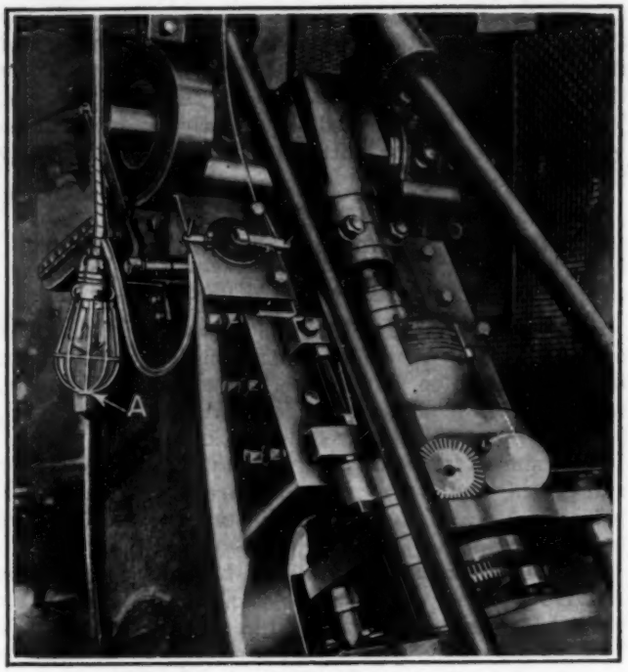
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

Electrically-Operated Signal for a Press

BY GEORGE FELTNER

In building rotors of electric motors it is important to assemble a stipulated number of laminations in order to obtain a correct resistance and a given rotor length. When it is necessary to count the laminations by hand, the operation consumes considerable time. Sometimes the laminations are weighed to determine a given quantity, while another method is to find the quantity by measurment from a stack. Since these methods have certain drawbacks, the device shown in the illustration is used in one shop to count the work as it is blanked.

The counting dial, located at the upper left hand of the ram slide, is provided with 117 teeth on its outer face, corresponding with the number of laminations required for a motor. On the plate that holds the dial is mounted a ratchet, operated by the crankshaft. Each stroke of the press indexes the dial a distance of one tooth. Likewise, with each stroke of the press a lamination is completed and slides down a chute to a locating rack on the floor in the rear of the press. The rack has five sections, each of which holds a set of laminations. When the dial has made a complete revolution, an electric connection is made, lighting the red lamp at *A*, which indicates that a set of laminations has been completed. At this time, the operator pulls a lever, indexing the rack so that the succeeding work drops in the next section. When the five sections are filled, the rack is removed and an empty one substituted.



Automatic counting device for laminations

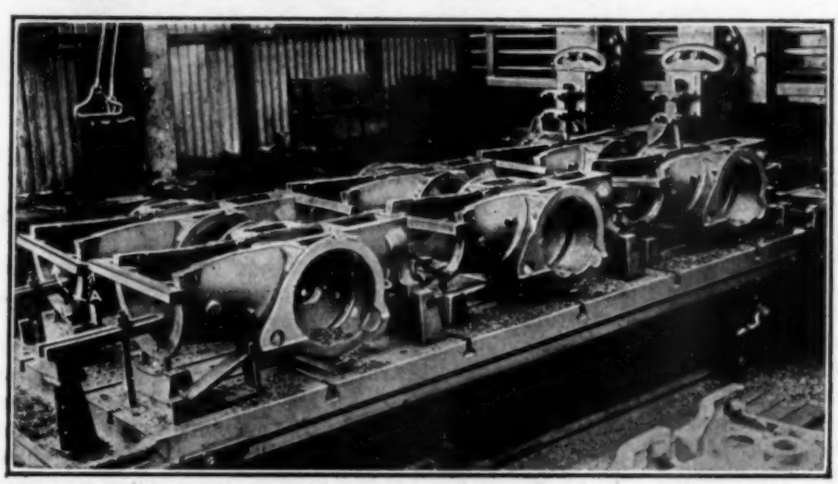
The device not only counts the work but stacks it uniformly in relation to its burr side, which is necessary in order to properly assemble the rotor. The laminations are 3½ in. in diameter, 0.022 in. in thickness, and have 39 slots. A blank and a finished piece are shown leaning on the ram of the press. The machine used is a No. 21½ Bliss inclined press.

Preventing Spring in Planer Work

By I. B. Rich

The illustration shows how the Holt Co., Stockton, Calif., prevents spring in the transmission cases of its tractors during the planing operation. Incidentally, it also shows the kind of blocking used for holding six cases at one setting. The blocking permits adjustments to meet almost any inequality in the castings and allows rapid setting-up.

In order to prevent the open ends of the cases from springing under the cut, and so preventing the planing of a true surface, the sides of each case are braced by the cross-bars *A*. The cross-bars are simply straight bars with projections that carry setscrews to be tightened on the flanges of the cases as shown. This method effectually prevents the spring that was experienced before the cross-bars were adopted. There is no attempt to fasten the cases together—each cross-bar being independent.

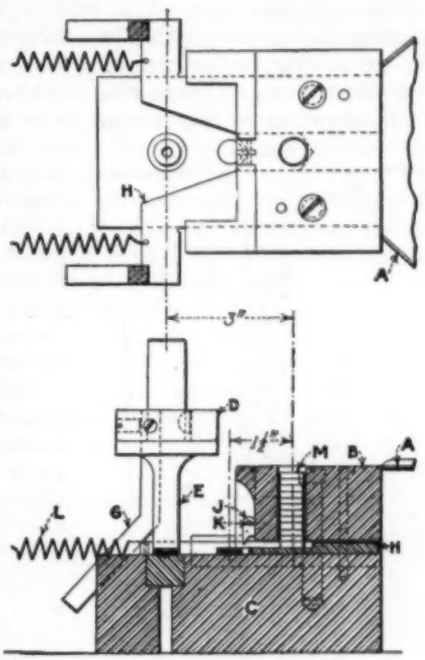


Braces to prevent spring in planing

Magazine Feed for a Forming Press

By J. E. Fenno

The illustration shows a magazine feed attached to a forming press. The workpan *A* is fastened rigidly to the front of the press table by suitable brackets, and is flush with the top of the magazine *B*, which, in turn, is attached to the top of the die-block *C* by screws and dowels. The arrangement allows the operator to slide the pieces from the pan into the magazine.



Magazine with two-stage feed

The cross-piece *D* is a force fit on the shank of the punch *E*, and is keyed thereon to prevent it from turning. Attached to the cross-piece are two hardened cams *G* for imparting longitudinal motion to the slide *H*. The pawl *J* is pivoted loosely on the pin *K*. The springs *L* keep the end of the slide against the cams, so that it will follow their motion on both the up and down strokes.

In operation, when the punch is at the end of the down stroke, the piece at the bottom of the stack *M* in the magazine, falls on the step of the slide *H*. As the punch rises, the slide moves forward, carrying the piece under and past the pawl *J*. As the punch comes down, the slide is pushed back, and as is recedes, the pawl holds the piece from following until the end of the slide passes from under it, when it falls to the top of the die-block. At the same time another piece from the magazine falls to the step in the slide. As the punch rises again, the slide comes forward and pushes the first piece directly over the die, ready to be formed when the punch descends. After being formed the piece is ejected by a jet of air.

In designing the magazine attachment, the first step taken was to

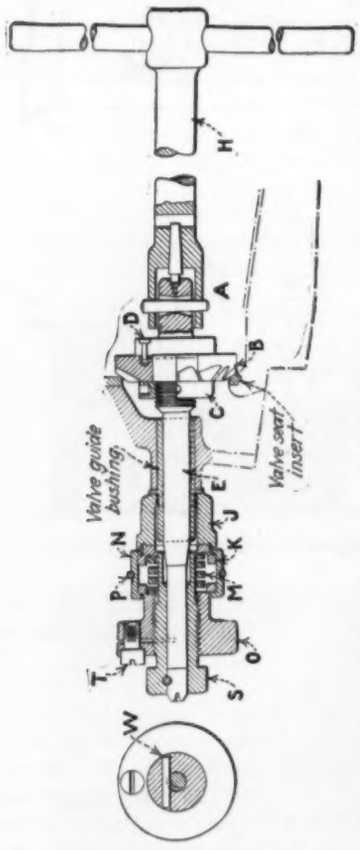
give consideration to the distance from the magazine to the punch. At least 3 in. was necessary to insure a safety for the operator's fingers. Since the stroke of the press was only 1½ in., and it was not deemed practical to make the angle of the cams more than 45 deg., the scheme of two-stage feeding was adopted to obtain the required 3-in. distance between the punch and the magazine. With this device the press is run continuously.

Hand-Operated Valve-Seating Tool

By Wm. VanAssen

The illustration shows a tool used on the cylinder assembly of aviation engines for finishing the angular valve-seats on the bronze valve-seat inserts.

The universal joint at *A* insures alignment of the angular valve-seat with the valve-guide hole, even though during the process of the operation the handle may become canted to one side or the other. The cutter itself, shown at *B*, can very easily be detached from the bar, and is held securely in position by the nut *C* and the driving pin *D*.



Tool for seating valves

The pilot bar *E* is fastened to the handle *H* through the universal joint. It carries the cutter *B* and pilots in the valve-guide bushing.

The bushing *J* is stationary, locating on the outside of the valve-guide bushing just above the flange. The friction ring *K*, against which the spring *M* acts, rides in the recess at the top of the bushing *J*.

The nut *O*, the spring *M*, and the friction ring *K* are held together as a unit by the two semi-circular housings *N*, which in turn are held in place by the spring *P*. By means of the saw slot and the fillister-head screw *T*, the nut *O* may be adjusted for any desired tension on the threads of the screw *S*.

In operation, the handle *H* and the pilot bar *E* with the cutter *B* in place, are lowered into the cylinder.

The pilot bar *E* is guided in the valve-guide bushing, and the smaller shank at the end projects beyond the top of the cylinder. The bushing *J* is then put in place. The nut *O*, the screw *S*, the friction ring *K*, and the spring *M*, together with the housings *N* and the spring *P*—all as a unit—are slipped over the shank of the pilot bar *E* and locked in position by the pin *W* in the groove near the end of the pilot-bar shank. The nut *O* is then screwed down, compressing the spring *M*. The bushing *J* and the friction ring *K* form a solid foundation against the flange of the valve-guide bushing, and the spring then tends to force the nut *O*, the screw *S*, and the pilot bar *E* together outwardly, so that when the handle *H* is rotated, the cutter is fed into the work. The nut *O* is then turned up slightly, and when the handle is rotated the cutter is fed into the work by the action of the spring.

Pneumatic Tripping Device for a Press

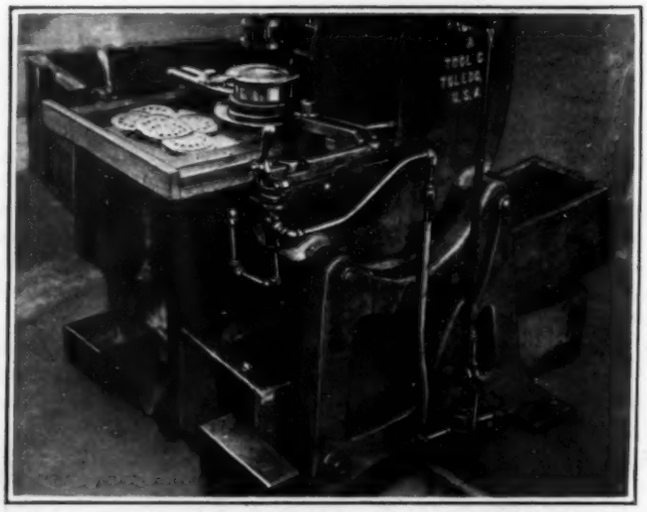
By Edward Stanton

A very simple, inexpensive and easily applied means of safeguarding the operator of a punch-press is shown in the illustration. It makes use of compressed air, with which all modern press rooms are already equipped, and requires no elaborate construction.

Two simple lever-operated air valves, an air cylinder and piston, and a few pieces of pipe and fittings comprise the bill of material. The installation can be made by anyone who is familiar with the use of pipe tools.

The pipe from the air main is brought down to the left front corner of the press bed, where the first air valve is located. From the outlet of this valve the air is piped across the front of the press bed to the opposite corner, where the second valve is placed. From the outlet of the second valve the air goes directly to the cylinder, which is fastened to the floor beside the press. The pull rod from the clutch is attached to the piston of the air cylinder.

Air cannot be admitted to the cylinder to trip the press except by opening both valves at the same time, and the operator cannot do this without using both



An air-operated trip for a press

hands. Clearly, if the operator's hands are at the extreme corners of the press bed at the instant the clutch is released, they cannot be injured by the descending tools.

This method has the advantage of leaving the tools entirely clear of obstruction by guards at all times; a condition that is appreciated by every press operator.

This installation is in service in the press shop of the Westinghouse Electric & Manufacturing Co., East Springfield, Mass., where its use is said to have increased production on a given job nearly 50 per cent over that obtained by the same operator, using the same set of tools in another and exactly similar press equipped with a guard.

Metal Working Industries Activity

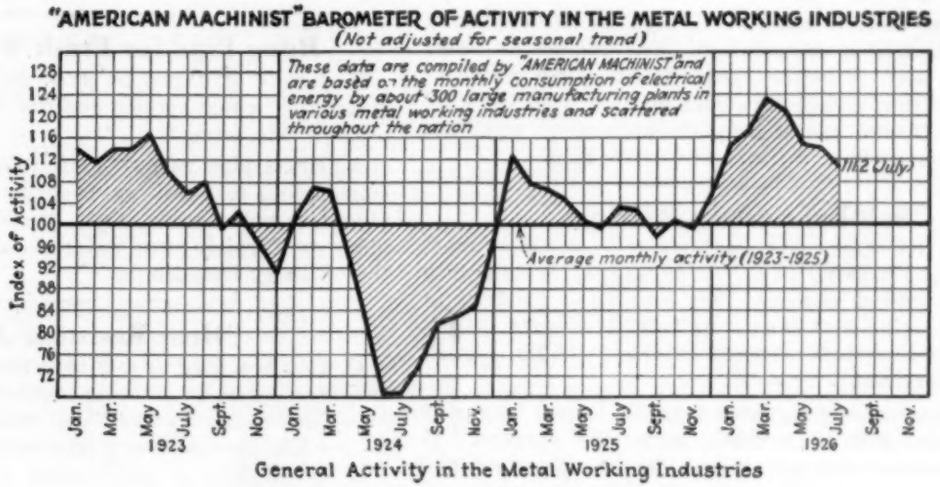
High Activity During July

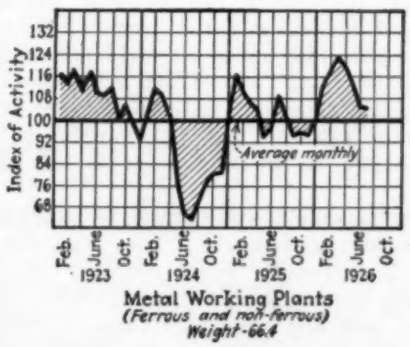
A continued high rate of activity was witnessed in the metal working industry of the nation during the month of July. The industry has been operating since the opening of the year greatly above the average for the past three years, the peak being reached in March, since which time operations have decreased month by month through July, a curtailment in operations which is normally expected at this season of the year. But during July the industry as a whole still operated at 11.2 per cent above the monthly average for the past three years. Notwithstanding the long period of sustained activity no fundamentally unfavorable factors have appeared.

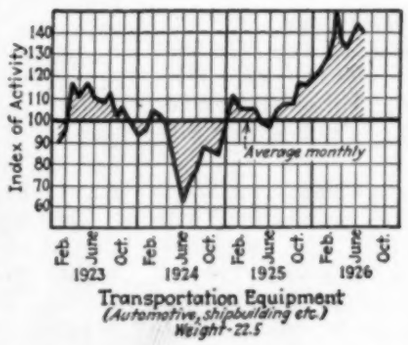
The actual production activity in the metal working industry during July was 2.7 per cent below that of June, the same companies reporting an electrical energy consumption during June of 69,700,000 kw.-hr. as compared with 67,750,000 kw.-hr. in June. Normally the July consumption of electrical energy is some 2.2 per cent under that of June, and the decreased activity during July is, therefore, close to that which normally would have been expected at this season of the year. These July reports of activity indicate that operations in the metal working industry continue to exceed those reported for the other primary industries of the nation as a whole.

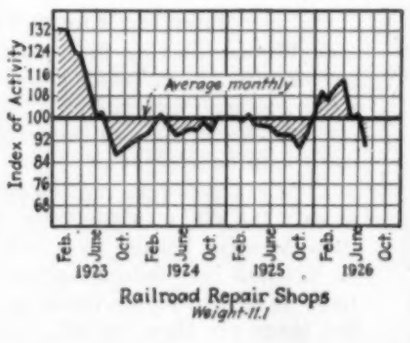
July activities in the metal fabricating plants of the nation were at a high rate for this season of the year. The July activity in this branch of the industry was about 15 per cent under that of the peak activity recorded during March, but in spite of this they were still 5.1 per cent above the monthly average for the past three years. The highest production activity of these plants is normally reported in January, and July is normally the lowest of the year, but during the July just passed the metal fabricating plants consumed only about 5 per cent less electrical power than during January.

A seasonal decrease in operations was also recorded by the automotive plants, but during July these plants operated at 40 per cent above the monthly average for the past three years, and only 14 per cent under the peak operations of March. These plants consumed over 7 per cent more electrical energy during July than during January, and 34 per cent more than during July of last year. The railroad repair shops were apparently operating at 15 per cent under the activity reported for June, but this decrease is largely seasonal in character. The accompanying charts are based upon monthly figures on electrical energy consumption by large manufacturing companies as collected by the *Electrical World*.


"AMERICAN MACHINIST" BAROMETER OF ACTIVITY IN THE METAL WORKING INDUSTRIES
(Not adjusted for seasonal trend)
These data are compiled by "AMERICAN MACHINIST" and are based on the monthly consumption of electrical energy by about 300 large manufacturing plants in various metal working industries and scattered throughout the nation
Index of Activity
(112 July)
Average monthly activity (1923-1925)
Jan. Mar. May July Sept. Nov.
1923
1924
1925
1926
General Activity in the Metal Working Industries







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Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Rotation of Worm Gearing

Q. The answer to the question on page 216, Vol. 65, of the American Machinist, *regarding the direction of rotation of worm gearing, brings up the further question as to the best location of the worm. Should the worm be placed on top or on the bottom of the wheel for best results? Of course the up or down position of the worm will give different directions of rotation of the wormwheel.*

A. There is no standard practice on this feature of design. Texts on machine design favor the lower position of the worm as it can then be run completely submerged in oil. The direction of rotation of the worm is designated as the primary direction regardless of its position, and the worm is assumed to be at the bottom of the wheel unless otherwise stated. The machine designer will usually be limited in his choice of position by the required position of the rotating shafts, and by the direction of rotation required in the wormwheel.

Acid for Etching Steel

Q. Please give me a formula for etching on steel. I do not get good results with nitric acid.

A. If the steel is hard or is high in carbon add a little acetic acid to the solution. The amount of water ordinarily used is in the ratio of four parts water to one of acid, but it will vary considerably with the kind of steel. If you are etching on high-speed steel use nitro-hydrochloric acid instead of nitric acid.

Self-Lubricating Bearings

Q. Can you inform me what material would be most suitable for a bearing on a ¼-in. brass shaft with a very slow longitudinal motion? This bearing is confined in a metal housing and cannot be lubricated with oil. It must stand temperatures from 30 deg. F. to 100 deg. F. without distortion.

A. A graphite-impregnated bearing bronze is on the market, and will undoubtedly serve the purpose. It would also seem that any one of the several commercial "oilless" bearings would meet your requirements.

Turning Large Brass Rings

Q. We are making brass rings measuring 8 in. outside diamter, 7½ in. inside diameter, and 1 in. wide, from a cast cylinder, and find that they go out of round when cut off. Have you any suggestions as to how this difficulty may be overcome?

A. We believe that the easiest and cheapest method is to cast the rings in the form of a "pot casting" with three legs for bolting to a face plate. The legs should be finished just before bolting to the plate. The cylinder is turned on its inside and outside diameters and the rings are then cut off. You can probably make a dozen rings from each casting.

If you have only a few rings to make and do not care to cast them in this manner, you will find that some of the distortion can be avoided by increased care in the turning. Bring out the working end of the casting as far as possible from the chuck jaws in order to avoid the spring from clamping. After roughing the ring on the two diameters and on the face, bring in the cut-off tool to a depth equal to at least half the thickness of the ring. Then finish, turn the ring all over and complete the cutting off.

Grinding Cast-Iron Cylinders

Q. We have taken on a job of boring and grinding a number of engine cylinders. The cylinder blocks are of cast iron, and the bore is to measure 4 in. in diameter and 10 in. in length. How much metal should we leave for grinding on the cast iron, and what is a reasonable degree of accuracy to expect from our shop?

A. The automobile shops that grind cylinders of approximately this diameter leave from 0.008 to 0.020 in. of metal to be removed by grinding, and the usual tolerance demanded is 0.001 in. We feel that you can reasonably expect this performance from your shop on this job.

Brass Pipe for Fresh Water Supply

Q. I have arranged to make an installation of brass piping for water service and am told that it is poisonous. Is this correct?

A. Brass pipe as now manufactured is not likely to be injurious for fresh water supply. In fact, good brass pipe does not corrode easily in cold water, and is more likely to furnish pure water for a longer period than the ordinary iron piping.

Heat Resisting Alloys

Q. Can you give us any information on the nature of the steel used in making carbonizing boxes. These boxes are claimed to be "heat resisting" and to give a longer life than ordinary iron or steel boxes.

A. A number of alloy steels are produced for this purpose under different trade names. The resistant properties of the alloys are derived chiefly from chromium and nickel, and the proportions of these metals in the alloy may reach above 75 per cent. Some of the "heat-resisting" alloys are not considered as steels. One such alloy with only 16 per cent of iron is claimed to be suitable for use at a temperature of 2,000 deg. F., although its melting point is less than 500 deg. higher.

The chrome-nickel steels are highly resistant to oxidation at elevated temperatures. They also show much higher tensile strength then ordinary steel when heated. Tests have indicated that a chrome-nickel carbonizing box will last nearly 20 times as long as an ordinary cast-steel box when exposed to carbonizing temperatures in a furnace.

Technical Abstracts

Technical Education

America has an unbalanced and top-heavy system of technical education compared with European systems. Material equipment is excellent, but the full possibilities of its use are lost. Material and teaching routine is exalted above men, and the men are paid in neither money nor honor.

American colleges are handicapped by a comparatively flabby and superficial scheme of secondary education, and they recover only about half the deficit by intensive four-year programs. Technical students abroad are expected to *get themselves* an education under the guidance of creative men and in an environment of real intellectual production, while here students are *given* an education. Our colleges are elaborate school houses; our students, overgrown school boys; and our professors, glorified schoolmasters.

In general, our program of technical education is suited to students of medium grade of ability and it overlooks young men of native ability and mental energy.

Continental Europe depends on the higher technical schools as research centers, while the large industrial research laboratory is essentially an American institution and is a handicap as far as education is concerned. — William E. Wickenden, in *Mechanical Engineering*, July, 1926, p. 794.

Optical Temperature Measurements

Optical methods for measuring high temperatures have been encouraged in recent years because the measuring element of the instruments is not exposed to the actual temperature of the furnace or hot body.

In the case of the optical pyrometer, the intensity of light from the hot body is compared with that of a calibrated lamp filament. The apparatus includes a telescope which is to be sighted on the furnace. The standard lamp is heated by a battery current, the amount of which can be controlled by means of a rheostat and read by means of an ammeter calibrated directly in degrees of temperature.

The lowest temperature at which best results can be obtained is about 1,112 deg. F. With a red glass interposed between the eye and the lamp, 5,432 deg. F. can be measured.

A second type of instrument is the radiation pyrometer. A telescope is again used and by its means the total radiation of the furnace or hot body is focused on the hot junction of a very small thermocouple with very thin wires. An emf. is thus generated in proportion to the temperature of the heat rays and which can be measured by means of a galvanometer.—Dr. M. Waldhausen, in *Fuels and Furnaces*, Aug., 1926, p. 939.

Stress and Fatigue

Various evidence seems to indicate that endurance under alternating stress should be correlated to the ultimate strength rather than the elastic limit of the material, particularly in the case of mild steel. Recent experiments made in Sweden with a series of flat plates drilled with various sizes of holes and subjected to alternate bending verify this view. The safe stress as calculated on the hypothesis that the strength was fixed by the elastic limit, not only was far above this elastic limit but also was in some cases even greater than the ultimate strength. The average stress over the net section, on the other hand, was much more nearly constant.

Other tests made by the same experimenter indicated that with a notched plate, the calculated limiting fatigue stress was 176,300 lb. per sq.in., while the average value over the whole section was 10,800 lb. per sq.in. This fact tends to prove that although a sharp fillet is a source of danger, it is not nearly so great as theory would indicate. It is suggested that there is some kind of plastic strain below the fatigue limit that allows the molecules of the metal to re-adjust themselves so as to reduce the effective elastic modulus in the regions of greatest strain.—*Engineering*, July 23, 1926, p. 93.

Material for Small Springs

The material for small springs is usually in the form of wire of round, rectangular, or square cross-section obtained by the repeated drawing of a bar through a die. Flat springs are preferably obtained by rolling round wire. The desired spring temper is obtained from the strain-hardening produced by the first draw, the annealing between intermediate draws, and the last unannealed draw. The spring temper is augmented by increasing the carbon content up to the eutectoid point in steel, or by increasing the tin content up to 10 per cent in phosphor bronze. Strain hardening must not be carried too far or the material will be damaged to a greater or less degree internally.

Music wire has about 0.85 per cent carbon and is cold-drawn to obtain the desired temper. Oil tempered wire has much less tensile strength than music wire but its elastic limit is proportionally higher. Alloy-steel springs are usually formed soft and then hardened and tempered. These include chrome-vanadium, silico-manganese, and chrome-molybdenum steel. Phosphor bronze, nickel silver, and Monel metal can be either rolled or drawn to temper.—J. K. Wood, in *Mechanical Engineering*, August, 1926, p. 808.

Carelessness in the Use of Abrasive Wheels

The greatest trouble encountered by manufacturers of abrasive wheels is the factor of ignorance of and indifference to instructions for the use of grinding wheels. When wheels fail to accomplish what is expected of them, or when they are broken in use or in handling, we generally find that instructions as to speeds, feeds, and conditions of machines upon which the wheels were operated have not been heeded. Also we believe that a great deal of trouble is due to carelessness which is due to lack of knowledge as to how grinding wheels are made, and that they are liable to break unless handled carefully.—E. W. Dodge, in *Abrasive Industry* for August, p. 245.

American Machinist

KENNETH H. CONDIT AND FRED H. COLVIN
Editors

Established 1877

When Is Standardization Justified?

STANDARDS that are justified are accepted from the start. Those that are not are so much waste paper. Obvious, of course, but how shall we know beforehand which ones are justified?

Several wise recommendations on this point are made in a general letter issued recently by the secretary of the standards organization of Czechoslovakia. He points out that a committee vote in the affirmative is no assurance that the standard in question will be adopted. It is much better to make a careful investigation of industrial and business practice that might be affected by the new standard to discover whether the proposed standard is accepted practice or not.

Another factor that should never be forgotten is that an economic saving must result from the new standard to justify it. Those connected with the project must keep at the job of estimating such savings and selling the idea on that basis to industralists, merchants and consumers.

If these points were more carefully considered by some of our enthusiastic standardizers here, there would be considerably less wasted effort.

Will Good Men Work in Your Shop?

A CLEAN and orderly shop is essential for the best results. A man may never try to figure out why he turns out more work, or why he feels better in one shop than in another. He will just know that life seems more worth living and that he is earning what he gets. Much of his increased output and greater satisfaction can be attributed to the cleanliness and orderliness of the better shop.

Every child learns the words, "a place for everything and everything in its place." Usually the child has to grow up before he finds that the words have a practical and remunerative application. Even the efforts of individuals in a shop to keep things straight are worth while, but benefits on a large scale cannot be achieved until the shop as a whole is working on a policy of cleanliness and orderliness.

Well-defined aisles, clean floors, cans for waste, racks for wrenches, tools, bolts and clamps, clean windows, white walls and ceilings, are some of the necessities in efficient shops. Work must be arranged in orderly piles, machines kept clean, chips removed, floors swept, racks or stands provided for unwieldy parts. Chucks, steady-rests, face plates, spare chuck jaws, wrenches and so on must be supported off the floor to permit thorough cleaning.

The greatest effect of a clean and orderly shop is shown in output. Other effects should not be overlooked: The customer who visits the shop is given confidence; labor turnover is decreased; the life of equipment is increased. Such a thing as a clean-up week or day will help, but the habit of cleanliness and orderliness is what counts in the shop. The condition of being right has to be constant. Some shops are putting it all over others just because they are places where good men are satisfied to work.

Securing Uniform Castings

IRON and steel scrap specifications may not seem to enter very closely into the building of machinery. But there is sufficient connection to make the new specifications recommended by the National Committee on Metals Utilization worthy of consideration and adoption. These specifications were prepared by the National Association of Purchasing Agents in co-operation with the American Railway Association, the National Association of Waste Material Dealers and others, the Department of Commerce being merely a clearing house as in all its work for standardization.

The quality of iron and steel scrap, however, has a direct effect on the castings used in machine construction, both as to the cost of machining and the wear of bearing surfaces. By using standard scrap the foundryman can give the machine builder more uniform castings and so aid in both production and satisfaction to customers.

Machine builders can help by securing copies of these specifications for their foundrymen and insisting that they be followed.

Commend, as Well as Complain

IT SEEMS to be a part of human nature to neglect commendation and only raise our voices when we want to kick about something. We mean to tell the maker of that tool or of this steel that it is fine, but we neglect to do so. But if it falls down on the job, the maker usually hears of it by the next mail or by wire.

If, however, we were more careful to tell just what we wanted in the way of material, or tools, and let the maker know when he had met our needs, it would be better for all concerned. If we let the maker know when he succeeds, as well as when he fails, he will feel more like assisting in solving our future problems.

Shop Equipment News

"Milwaukee" Milling Machine No. 3, Improved

The Kearney & Trecker Corporation, Milwaukee, Wis., has improved its No. 3 milling machine. Except for the fact that it is smaller in size, the No. 3 machine is identical in design features with the improved No. 4 machine, which was described on page 881, Vol. 64, of the *American Machinist*. The machine is available in the plain, universal, and vertical types.

As in the case of the No. 4 machine, the No. 3 machine is designed primarily for built-in motor drive, although provision is made for belt drive at the option of the customer. The same column is used in either case, and to change from motor to belt drive it is only necessary to remove the rear door of the motor compartment and to bolt in its place a bracket sleeve and pulley. The change can be made at any time during the life of the machine.

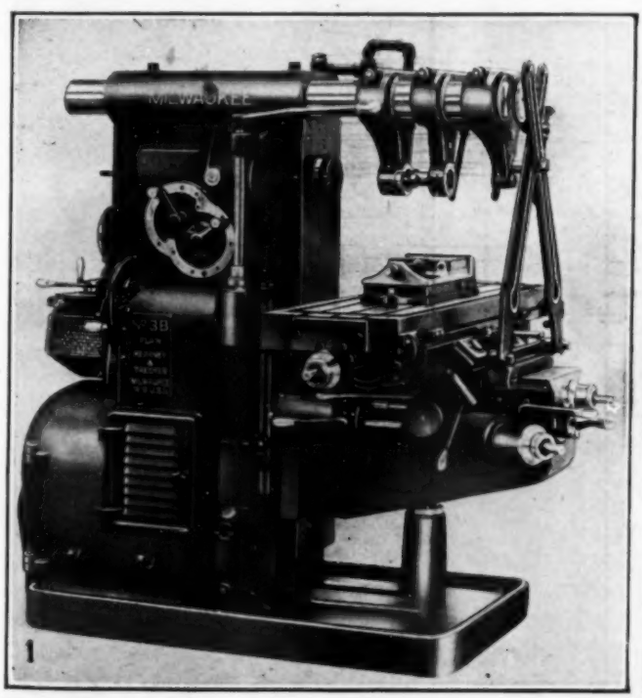
The motor compartment is totally inclosed in the base of the column, and adequate ventilation is provided by louvres in the rear door and side of the column, as shown in Fig. 2. Ventilation is further aided by means of a fan on the primary drive shaft. Both the motor and the drive are on the inside. The drive is direct through gears, and the motor is set with its pinion facing the front of the machine where it receives automatic flood lubrication, as do all other gears and bearings inside of the column. In order to insure quiet operation, the three initial fast running gears have ground teeth.

Timken roller bearings are used throughout with the exception of the main spindle bearings. Automatic flood lubrication is provided for all gears and bearings in the column and feed box. Splash lubrication is used for all rapidly moving parts underneath, while wick oiling is provided for the table and saddle bearings. Two separate oil pumps are furnished. One is for the automatic flood lubrication, and the other for the cutter coolant. Either pump can be removed quickly without touching a pipe joint. In order to take care of the large quantity of coolant supplied by the pump, six oil pockets are placed in the table to collect the oil and return it to the reservoir. A large quantity of coolant is supplied at low pressure through generous-sized pipes, so that it is possible to run the machine at high speeds without injuring the cutters.

The table, saddle and knee all have power rapid-traverse, longitudinal, across, and vertical, respectively. All movements are conveniently controlled from the front of the machine.

Other important features include duplicate control levers, both front and rear; high- and low-speed feed attachments, providing 36 speeds; a table lock for boring operations; a sliding-gear transmission feed box with all gears heat-treated and hardened; a protected flange spindle nose; a solid top knee; a double overarm support to the arbor; a safety slip clutch, protecting the feed mechanism in case of meeting with positive obstruction; and a multiple-disk friction clutch for both main drive and power rapid-traverse control.

Self-lubricating universal joints are also featured. The two forks are connected to pins set in an outside ring in which the oil collects.



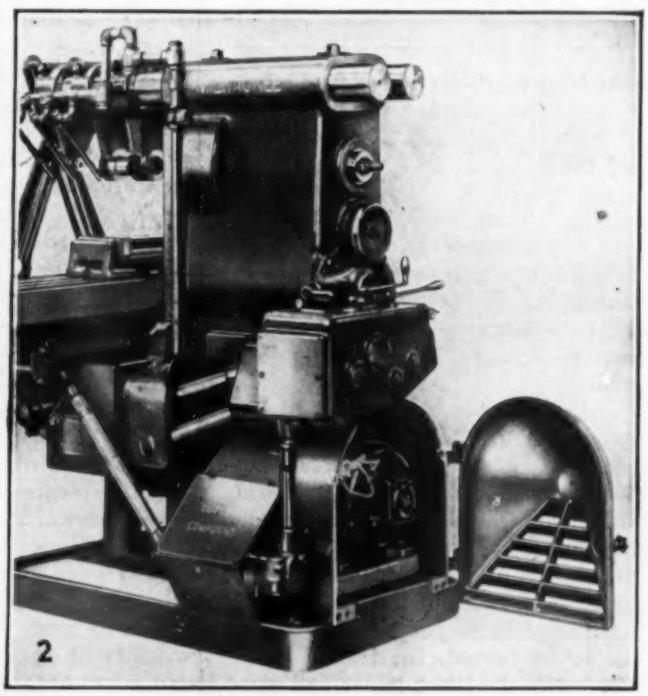


Fig. 1—"Milwaukee" Milling Machine, No. 3, Improved. Fig. 2—Location of the motor within the column

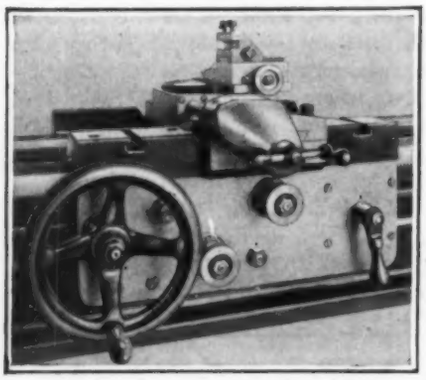
Shop Equipment News

Ball-Turning Device for Flather Lathes

The ball-turning fixture illustrated is being marketed by Flather & Co., Inc., Nashua, New Hampshire, for use with any standard style of this company's lathes.

The attachment is self-contained, and it replaces the regular cross-slide. The latter is run off its screw and removed from the lathe, and the device is substituted by sliding its dovetailed base on the cross ways of the bridge of the carriage and clamping it in position. The handle and sleeve are also removed from the front end of the cross-screw, and a special quill gear is substituted for the sleeve.

It is necessary to locate the vertical axis of the rotating table accurately with reference to the center of the ball to be turned, after which the carriage is clamped to the shears



Ball-Turning Device for Flather Lathes

and the base of the device clamped to the bridge, so that there can be no traverse nor crosswise movement.

On the surface of the rotating table there is a small compound rest, having its movements at a right angle to each other. The lower member is controlled by means of a small auxiliary cross-screw, while the upper member is secured to the lower one by clamps. The upper member, which is the tool-holding block, is hardened and is provided with two setscrews, corresponding to the toolpost screw. Any standard cutting tool may be used.

After the point of the cutting tool is adjusted in proper relation to the ball to be turned, the tool block is clamped to the lower slide. All subsequent adjustments are made by means of the knurled knob of the small cross-screw, which controls the diameter of the ball and makes the adjustments for successive cuts as readily as may be done with the regular cross-feed screw on straight turning.

The rotating table is driven by the regular cross-feed mechanism of the lathe. The rate of feed is adjusted or the direction of rotation reversed at the geared feed-box on the headstock. The feed is engaged or disengaged by the cross-feed knob on the front of the apron.

The drive is through a wormwheel and worm inclosed in the base of the device. The outer end of the worm shaft terminates in a pinion that meshes, through an intermediate gear, with the special quill gear that has been substituted for the sleeve on the cross-screw. There being no nut under the base of the device, the cross-screw is free to rotate, and it acts merely as an intermediate shaft.

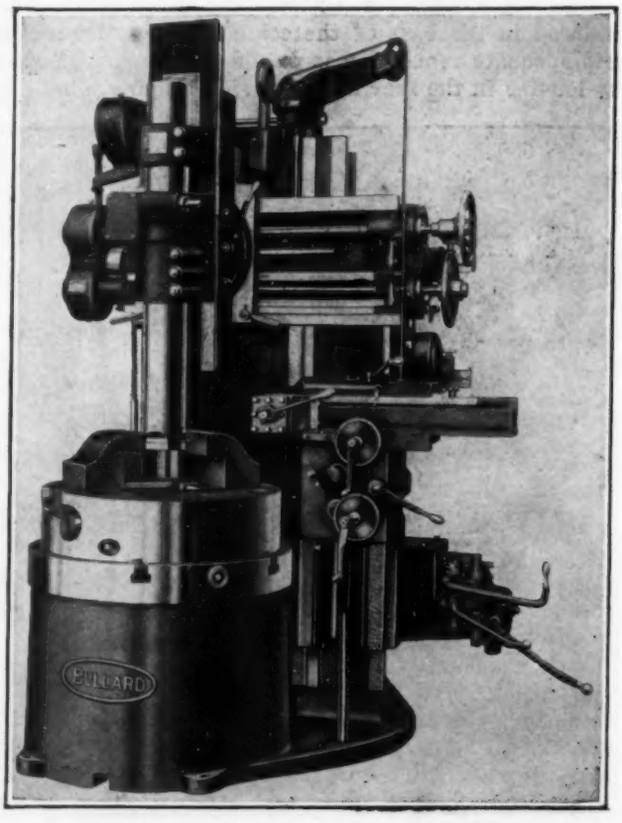
Bullard Driving-Box Borer and Facer

The Bullard Machine Tool Co., Bridgeport, Conn., has announced the improved driving-box boring and facing machine shown in the accompanying illustration. The improved design incorporates a heavier support for the bar and cutting tools, and an adjustment in bar extension from the main slide to adapt the machine for various lengths of boxes.

For short driving boxes, where little extension is required, the cutting tools are supported in the machine closer to the point of cutting. The adjustment for the tools is made easily by means of a handcrank through a worm and gear to a rack in the bar. Adjustment is made for the various diameters of boxes by means of a cross traverse that brings the main head, bar, and cutting tools close to the work, so that excessive overhang or extension of tools from the boring bar is avoided. Travel of the cross traverse can be read directly on a scale and micrometer dial.

The machine is equipped with a heavy two-jaw, self-centering chuck. The chuck is designed to hold the work accurately on the vertical axis. The table is provided with a graduated micrometer cross-adjustment to be used for accurately boring reliefs.

Another feature of the machine is a constant speed drive pulley with a multiple disk clutch and brake for starting and stopping. All speed and feed changes are obtained by means of sliding gears. The standard Bullard features are also incorporated in the machine, such as power rapid traverses and constant flow lubrication. Direct reading scales and micrometer dials are provided on the feed rods. The machine has also been strengthened on all parts subject to the strain of heavy cutting.



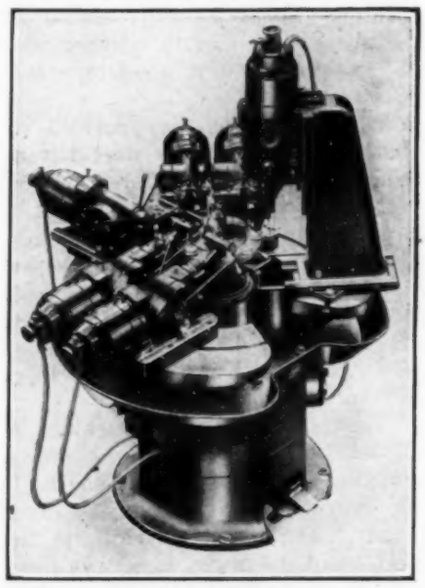
Bullard Driving-Box Borer and Facer

Shop Equipment News

Kingsbury Semi-Automatic Drilling Machine Type G. A.

The machine shown in the accompanying illustration is of a semi-standard type built by the Kingsbury Machine Co., Keene, New Hampshire. It consists of a standard base with a flat, circular top upon which any number up to six of the Kingsbury standard No. 18 motor-driven drilling heads may be mounted. It is designed for the production drilling and tapping of small parts in which the several holes must be accurately positioned relative to each other.

The No. 18 drilling head is in itself a complete unit, consisting of a driving motor, an automatic variable feed, and a clamping attachment to hold the work. The spindle may be fitted with a drill chuck to carry a drill, or with a standard tapping attachment. These heads may be clamped to the base of this machine at any desired angle in the horizontal plane, or, by means of special supporting heads as shown at the right in the illustration, in any plane.



Kingsbury Semi-Automatic Drilling Machine, Type G.A.

The supporting fixture here shown is a right angle, to hold the drilling spindle in vertical position and to allow it to be adjusted for height. Special fixtures may be made to support the drilling head at any angle to suit the nature of the work for which a particular machine may be intended.

The work piece for which the machine here shown is adjusted is a round cup-shaped part for a patented electrical device. There are three holes to be drilled in a horizontal plane, two holes are to be tapped, and one hole is to be drilled in a vertical plane. The pieces are held in special fixtures upon an indexing turret that rotates about a vertical axis. Indexing plates are made with one position in excess of the number of stations in order to provide a loading position.

The work is loaded and the turret indexed by hand. A trip lever starts the feed movement of all heads simultaneously. The movement is cyclic; first, the work is clamped on the fixture to prevent it from being displaced by the thrust of the tools, second, the drilling or tapping is done, third, the tool returns to starting point, and lastly the movement trips out automatically.

The operator's duties are confined to loading the fixtures, indexing the turret, and tripping the starting lever. One piece is finished at each indexing movement after the turret is filled.

The maximum drill size is $\frac{3}{4}$ in. and the maximum range of feed movement is $1\frac{1}{2}$ in. The floor space occupied is $4\frac{1}{2}$ x $5\frac{1}{2}$ feet.

Hurlbut-Rogers Multiple Cutting-Off Machine for Hollow Stock

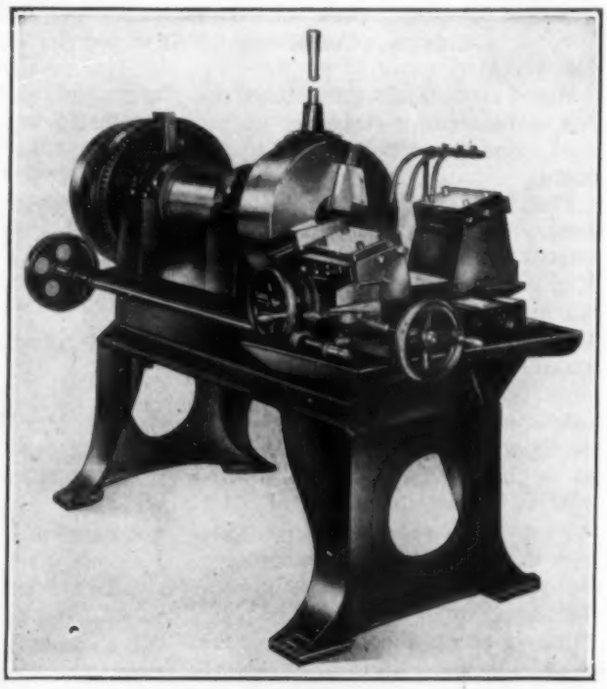
A modification of its 6-in. cutting-off machine, adapted to cut off hollow stock or tubing in multiple cuts, has been placed on the market by the Hurlbut-Rogers Machinery Co., Nashua, New Hampshire. The machine is intended primarily to cut off rings for ball bearings, but may be applied to any similar purpose.

The tool blocks are arranged to hold three or more ground cutting blades, separated by ground spacing blocks of the desired width and backed up by adjustable anvil screws. The cross-slides are moved by an extra heavy right-and-left-hand screw, fully inclosed to protect it from dirt and chips.

The machine is arranged for a belt drive with spur gear speed reduction between the coneshaft and main spindle. The coneshaft is located below and parallel with the main spindle, and it has a four-step cone for a 5-in. belt. Power feed on the cross-screw is available through a worm and wormwheel, operated by a feed shaft that is provided with a three-step cone to change the feed.

A Foster-Barker wrenchless chuck at the front end of the main spindle grips and drives the stock, which is centered and steadied at the rear end by a standard universal chuck.

The machine occupies a floor space of 3x7 ft., and weighs 3,800 pounds.

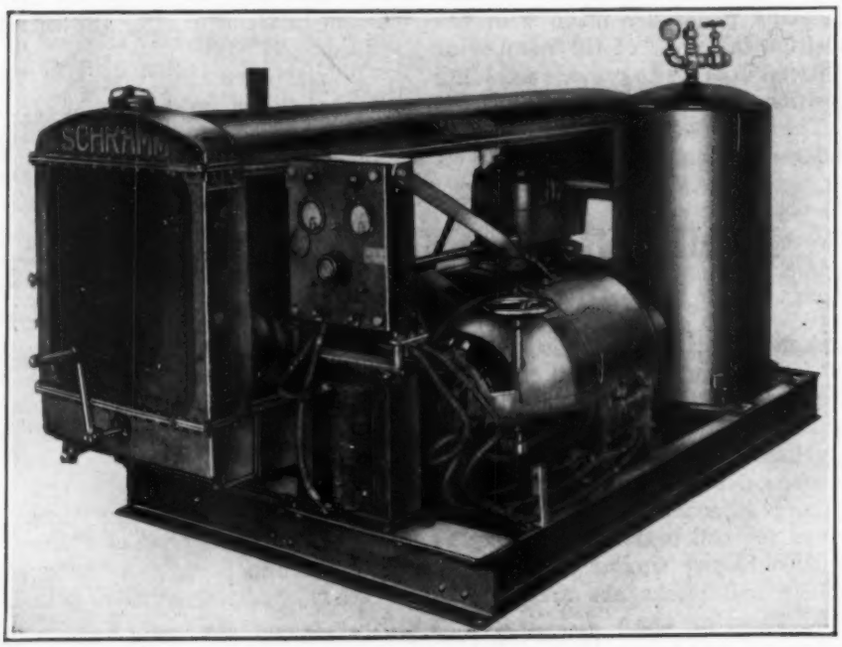


Hurlbut-Rogers Multiple Cutting-Off Machine for Hollow Stock

Shop Equipment News

Schramm Combination Welder and Air Compressor

A combination arc welder and air compressor driven by a gasoline engine and mounted upon a single base has been placed on the market by Schramm, Inc., West Chester, Pa. The unit consists of a Buda gasoline engine, a Schramm compressor, and a General Electric welding outfit. The complete equipment may be for use in field work. The air compressor can be used to operate drills, grinders, and chipping hammers for cutting, peening, caulking, and cleaning off scale. The compressor can also be used in preparing work for welding. With this particular style of welder both light and heavy gage steel can be welded as well as cast iron. After the welding operation has been completed, the compressor clutch is thrown and the weld can



Schramm Combination Welder and Air Compressor

mounted on a standard two-ton truck or can be made portable by adding steel or rubber-tired wheels to the frame.

The Buda engine is a 24-horsepower, 800-r.p.m. unit, which may be started and operated independently of either the compressor or the welding generator. The Schramm compressor is a two-cylinder, water-cooled machine with a capacity of 120 cu.ft. per min. and is equipped with an automatic unloading device. The air receiver is 16 in. in diameter by 42 in. high. The General Electric welding equipment consists of a belt-driven WD-12 arc-welding generator together with the necessary leads and the holding device for the welding rod. An idler tightening pulley is provided on the belt. By means of a Borg & Beck 12-in. clutch coupling, either of the machines may be connected to the engine.

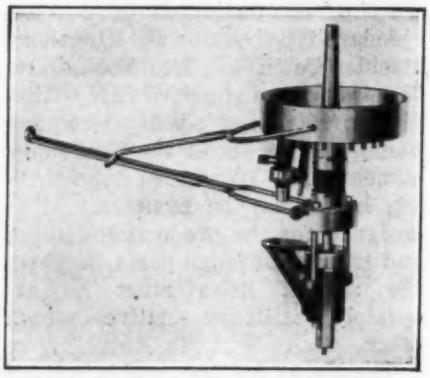
This combination unit is intended be ground or chipped by means of a pneumatic tool. In this way it is claimed that a complete job can be accomplished with a single machine.

The structural steel base is 8 ft. 4 in. long, and 5 ft. 11 in. wide. The unit is 3 ft. 10 in. high. The total net weight is 4,000 pounds.

Metal Saw and Machine Co. Automatic Screw-Driving Machine

The Metal Saw and Machine Co., Inc., 40 Napier Street, Springfield, Mass., is marketing the automatic screw-driving machine illustrated. The machine is equipped with a standard taper shank so that it can be readily inserted in a drilling machine spindle. It is made in twelve sizes to accommodate screws ranging from ¼ to 2¼ in. in length.

The screws are thrown into the hopper in half-gross lots, and no individual handling is necessary. The hopper has an eccentric motion that causes the screws to fall into a slot large enough to loosely enclose the necks of screws but which does not



Metal Saw and Machine Co. Automatic Screw Driving Machine

allow the heads to pass. The operator brings down the feed lever, and as one screw is driven rapidly into the work, another automatically takes its place.

Before the screw is driven it is plainly visible to the operator and consequently can be easily located on the work. The delivery member may be stopped at any pre-determined point.

A torsion device is provided so that screws cannot be over-driven. When the resistance offered by the tightening of the screw reaches a pre-determined amount, the clutch is thrown out of gear, and the screw driving spindle remains stationary until it is withdrawn from the screw head. The spindle is operated at 650 r.p.m. and hence the screws are driven home quite rapidly.

The smallest size machine is Model No. 2. It handles No. 2 screws, ranging from ¼ to ½ in. in length. It is provided with a No. 1 Morse taper. The largest machine is No. 14L and handles No. 14 screws ranging in length from 1½ to 2¼ in. It is provided with a No. 3 Morse taper.

"Rockwell" Hardness Tester, Model G

The Wilson-Maeulen Co., Inc., 383 Concord Ave., New York, N. Y., announces an improved model G "Rockwell" hardness tester, shown in the accompanying illustration. The machine has been made smaller and sturdier in construction. The cast-

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ings are held in position rigidly by two heavy steel columns.

The elevating screw operates in a hardened tool-steel bushing and adjustment is provided to bring this bushing exactly central with the penetrating point, a condition that is particularly important when wire or round rod is being tested. The nose of the machine is more highly ta-

"Rockwell" Hardness Tester, Model G

pered in order to give greater visability at the point of test and to permit the nose to enter recesses.

In the smaller models of the older machines, the operator's hand, after adjusting the dial to zero, had to move to the bottom of the machine in order to release the major load. In the improved machine, the operator's hand need be moved only an inch to the right of the dial to apply the major load by means of a handle. The handle cannot be seen in the illustration, but the lever it actuates can be seen engaging a slot in the pivoted arm of the leverage mechanism. The principle of operation of the leverage systems for applying the load and for measuring the depth of impression, respectively, remain the same, and no dimension changes have been made. The hardness readings are the same as for the older models.

The working parts in the head have been made more dustproof, and in general, the design is such the machine can be readily repaired.

Warner & Swasey Universal Turret Lathe No. 3-A, Capacity 4½-In.

A No. 3-A heavy-duty, universal turret lathe, with 4½-in. bar capacity and incorporating several improvements, has been brought out by the Warner & Swasey Co., Cleveland, Ohio. The machine, shown in the accompanying illustration, retains many of the features of the 7½-in. bar-capacity machine described on page 877, Vol. 64, of the *American Machinist*. Due to the fact that it is a smaller machine however, several other changes have been made. The design is such that heavy cuts can be taken with both the hexagon turret and square turret at the same time. In addition the tooling provides for multiple cuts from each turret station, and proper rigidity is provided for supporting such cuts under heavy feeds.

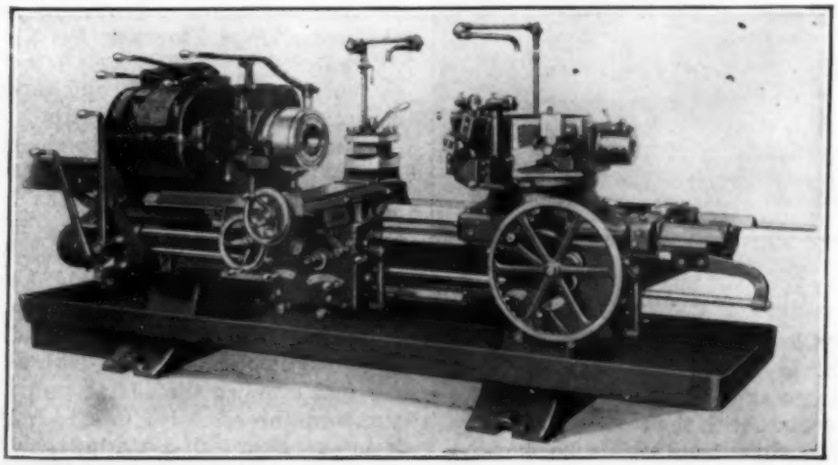
The capacity for bar work and the swing over the ways have been materially increased. For bar work the machine has a capacity through the chuck for 4½-in. round bars, and a maximum turning length of 45 in. On chucking operations the machine is equipped with an 18-in., extra-heavy, three-jaw, geared scroll chuck. The maximum swing over the way covers is 25¼ in., while the square turret carriage clears a diameter of 18 in. The hexagon turret carriage has a maximum longitudinal movement of 48 in. while the square turret has a cross travel of 12¾ inches.

The size of the all geared head has been reduced as compared with the larger machine, but the same broad-faced, hardened and heat-treated alloy-steel gears are used. A driving motor of 10, 15, or 20 hp. is supplied. Twelve spindle speeds are available, controlled by means of a single sliding clutch. The front and back shafts are mounted on taper roller bearings adjustable for end play. The main bearings, however, are babbitted.

The lathe is provided with an automatic chuck. In order to take care of variations in stock size the rings can be adjusted to $\frac{1}{16}$ in. under the standard size. The master jaws are furnished with bushings, and they will not collapse so as to interfere with the introduction of a new bar of stock. A ratchet bar feed operated by a separate lever is furnished to handle heavy stock. The automatic chuck is removable for the substitution of a scroll chuck.

The roller carriers for the universal turner are of large proportions and are adjustably mounted in the tool. The rollers are hardened and ground. The cutter may be set to precede or to follow the roll. A dial is provided with graduations for accurate sizing. The setting of the cutter is maintained by a thumb screw and is withdrawn by a quick acting lever in order to avoid danger of marring the work. Overhead piloted tooling is provided as standard in the chucking equipment.

The feature of patented covered ways has been retained. With this design grit, chips, and cutting lubri-



Warner & Swasey Universal Turret Lathe No. 3-A, Capacity 4½-In.

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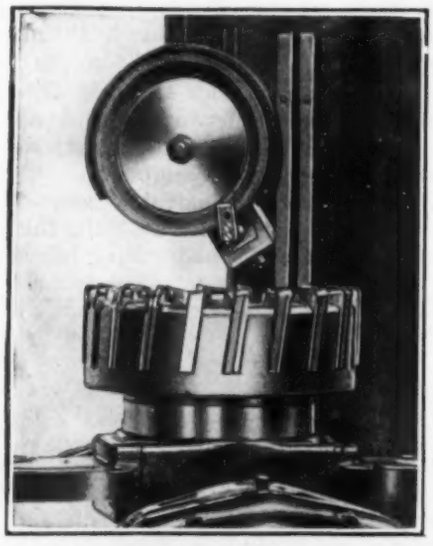
cant are prevented from reaching the surface of the ways and thus destroying their accuracy.

The outside split ring binding mechanism for the turret has also been retained. Both the hexagon turret and the square turret carriage are each equipped with sixteen feeds. The turret feed is engaged and released by means of levers contained in the saddle apron. The feeds are automatically disengaged by adjustable stops on the stop roll which is located between the Vs. The stops can be quickly and accurately set. Power rapid traverse is also provided.

Tooth-Rest Attachment for Cincinnati Face-Mill Grinders

The Cincinnati Milling Machine Co., Cincinnati, Ohio, has added a special tooth-rest attachment to its face-mill grinder. The device is for use in spiral grinding the peripheral edges of a face mill.

The attachment is fastened to the wheel slide underneath the front spindle bearing. The tooth-rest blade is tilted to correspond with the rake of the cutter blades. It is set



Tooth-Rest Attachment for Cincinnati Face-Mill Grinders

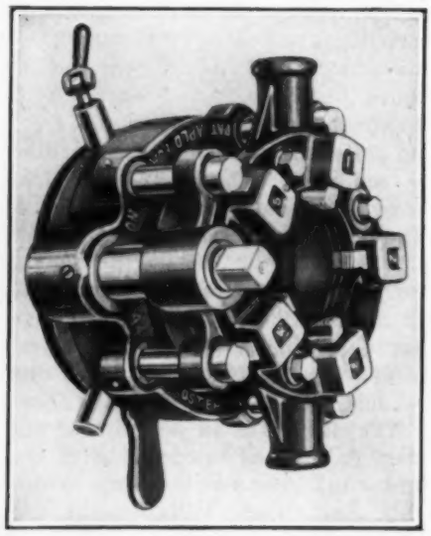
as low as the spacing of the cutter blade swill permit. The operator rotates and keeps the cutter blade in contact with the tooth-rest blade with his right hand, while he moves the wheel slide up and down with his left hand.

The device is adjusted to the proper angle by means of a clamp actuated through a hexagon cap screw.

"Receder" Pipe Threader No. 44

The No. 44 "Receder" pipe threader illustrated has been placed on the market by the Oster Manufacturing Co., Cleveland, Ohio. The tool is intended to handle all sizes of pipe ranging from 2½ to 4 in. nominal size.

The dies are narrow and are ground with an extra long lead and a sharp rake in order to produce easy cutting qualities. For the same reason, the tool is geared and is furnished with a ratchet handle so that one man can cut a 4-in. pipe without too much effort. A heavy leader screw is used to start the dies on the pipe and to pull them along



"Receder" Pipe Threader, No. 44

so that the proper pitch and taper is produced. The leader screw is protected by a patented chip shield, so that the screw is not subjected to any undue wear that might be caused by the presence of chips and dirt.

A rotary movement is provided on the die head for adjusting the dies to cut either deep or shallow threads, so that it is possible to cut both under and oversize threads as well as standard threads with this tool. A lever-operated, self-centering chuck is used to hold the pipe, and the use of pipe bushings is avoided. It is claimed that the threading of short nipples is possible, as the bore of the stock is large enough to accommodate a 4-in. coupling.

Trade Catalogs

Bearings, Ball. Standard Steel & Bearings Inc., Plainville, Conn., has issued an 8-page pamphlet entitled "Molybdenum Means More-Life-In-'Em—Why?" It is a story of the development and use of molybdenum steel for SRB forged balls. The method of manufacture is also described and illustrated.

Bearings, Tapered Roller. The Timken Roller Bearing Co., Canton, Ohio, has issued a loose leaf 8½x10-in. booklet entitled "Timken Engineering Journal." Sixty-four pages comprise this initial section of what is intended to be a complete treatise on the application of tapered roller bearings to automotive and industrial equipment. The design and manufacture of this type of bearing is first described. Simplified load calculations are then considered by means of illustrative examples. The mounting and adjustment of the bearings, proper inclosures, assembly methods, lubrication, and shop inspection are treated in turn. Complete specifications and dimensions for all types and sizes of bearings manufactured are given.

Burners, Oil and Gas. The W. S. Rockwell Co., 50 Church St., New York, N. Y., has issued an 8-page bulletin describing its oil and gas burners for industrial heating furnaces. The subject is treated in a sound technical manner without advertising flourish. The bulletin is profusely illustrated.

Chucks. The Westcott Chuck Co., Inc., Oneida, N. Y., has published its catalog No. 520-A, in which are described lathe and drill chucks. The spur-geared scroll combination and universal lathe chucks, the I.X.L. Independent lathe chucks in several forms, and various styles of "Little Giant" drill chucks are described and illustrated by means of numerous photographs. The booklet contains twenty 4x7-in. pages.

Clutches and Couplings. The Hill Clutch Machine & Foundry Co., Cleveland, Ohio, has issued catalog No. 26 in three sections. The first section illustrates and describes a new type of flexible coupling and various transmission equipment. The "Cleveland Type" oil film bearing is also described and illustrated. The second section covers the application of the "Smith Type" clutch pulleys and cut-off couplings. Engineering tables on belt transmission are included. The third section also contains some general engineering data, but is particularly devoted to rope drive. The catalog has a total of 258

Shop Equipment News

pages, and is bound with cloth covers. Many illustrations and line drawings are included.

Dilatometer. The Stanley P. Rockwell Co., Hartford, Conn., has issued a one-page bulletin No. 2607 on its dilatometer, an instrument for recording the heat and the heat absorption of steel during heat treatment.

Drills and Reamers. The Whitman & Barnes Manufacturing Co., Akron, Ohio, has issued a four-page illustrated bulletin describing its Hercules drills and reamers, with particular reference to their use by the Newport News Shipbuilding & Drydock Co.

Fans. The American Blower Co., Detroit, Mich., has issued bulletin No. 7003 describing the American H. S. Fans, Class 15M. The booklet contains twenty-eight 8½x10-in. pages. The construction of the fan and its various parts is described and illustrated by means of numerous photographs. Many tables of engineering data are given as well as complete specifications for the various sizes and mountings of the fans.

Forging Jaws. The National Machinery Co., Tiffin, Ohio, has issued a one-page bulletin entitled "National Forging Machine Talk No. 58." Six-step die forges for pull rods and the like, used in brake rigging on English locomotives and cars, are described and illustrated.

"Grefco." The General Refractories Co., Philadelphia, Pa., has issued a leaflet describing a high temperature refractory cement composed of a chrome-ore base that is neutral in character, and is said to resist both acid and basic slags in metallurgical work.

Grinders, Internal. The Ex-Cell-O Tool & Manufacturing Co., Detroit, Mich., has published a booklet entitled "The Story of Some Interesting Grinding Achievements with Ex-Cell-O Internal Grinding Spindles." The design and manufacture of high-speed grinding spindles and a special type of ball-bearing suited for this service is described and illustrated by means of numerous photographs and cross-sectional line cuts. Complete specifications for various spindles that may be adapted for use with standard grinding machines are given. A high-speed air-turbine drive also is featured.

Grinding Machines, Cylindrical. The Norton Co., Worcester, Mass., has published four bulletins describing its cylindrical grinding machines. Three of the bulletins are devoted to the Type A machine with power traverse, hand traverse, or special purpose features. Two of the bulletins are 12 pages, the third is 16 pages. The fourth bulletin describes the "Autopart" regrinding machine. It has 12 pages. The characteristic feature of each unit is described in detail, and complete specifications are given. Numerous photographs are used to illustrate the bulletins.

Hand Lift-Trucks. The Steubing Truck Co., Cincinnati, Ohio, has issued a leaflet entitled "Multiplying Men," in which several features of the model K hand-lift truck marketed by this company is described.

Hoisting & Hauling Machinery. The Sullivan Machinery Co., 122 South Michigan Ave., Chicago, Ill., has published a 16-page booklet, No. 132, entitled "Handy Hoisting and Hauling." The application of small portable hoists to a large variety of industries is brought out by means of photographs and captions. Over sixty illustrations are employed.

Lubricators. The Keystone Lubricating Co., Philadelphia, Pa., has published a 48-page booklet entitled "The Keystone Safety Lubricator, Questions Answered and Typical Installations Illustrated." The booklet gives a thorough discussion of the lubricator, its purpose, method of operation, relation to safety, and adaptability. Various types of installations are illustrated by means of numerous photographs.

Measuring Tools. The Van Keuren Co., 12 Copeland St., Watertown, Boston 72, Mass., has issued a 16-page catalog on "Modern Measuring Tools." In it are described light weight measuring equipment, combination reference gages, micrograges for utility gage blocks, plug gages for production, thread-measuring wires, micrometer laps, flat laps, lapped steel surface plates, and square plug gages. Useful information on various styles of threads is also included.

Portable tools. R. G. Haskins Tool Co., 3450 West Lake St., Chicago, Ill., has issued a 16-page booklet entitled "Taking the Tool to the Work." It contains a picture story of various applications for portable tools driven through flexible shafting. Each example is given in the form of a photograph and a caption.

Pyrometer, Optical. The Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa., has issued its 12-page bulletin No. 293 describing its H-K optical pyrometer. The construction of the instrument is explained and information is given about its proper use for the measurement of high temperatures. The method of making temperature determinations and the precautions to be observed are given in tabulated form for various types and places in industrial furnaces, with particular reference to iron and steel furnaces.

Railway Machine Tools. The Niles Tool Works Co., Division Niles-Bement-Pond Co., Hamilton, Ohio, has issued three circulars describing machine tool equipment for railroad shops. Circular No. 326 contains eight 8½x11-in. pages, and is devoted to the description of the Niles 90-in. journal turning lathe. Circular No. 327, of the same number and size of pages, is devoted to the description of a car wheel borer. Circular No. 328 is a four-page bulletin in which the 90-in. quartering machine is described. In each case numerous photographs are used to show the various parts of the machine, its construction and operation, and principal features.

Reamer, Expansion. The Morse Twist Drill & Machine Co., New Bedford, Mass., has issued a pamphlet describing its No. 717 spiral-fluted expansion reamer.

Taps. The Vermont Tap & Die Corporation, Newport, Va., has issued a 44-page booklet in which its various types of taps are described and illustrated by means of photographs. Several pages of useful tables of standard threads are appended.

Whiting Products. Whiting Corporation, Harvey (Chicago), Ill., has published a condensed catalog No. 175 describing its products. The booklet consists of forty-eight 8½x11-in. pages and is profusely illustrated with photographs of various applications of the equipment. The major part of the booklet is devoted to foundry equipment such as cupolas, ladles, tumbling mills, core-oven equipment, overhead trolley systems, air hoists, steel converters and the like. Space is also given to electric cranes, jacks, hoists, drop tables, transfer tables, turn-tables, hydraulic gate hoists, and special machinery; chemical plant equipment is also listed.

Woodworking Machinery. The Oliver Machinery Co., Grand Rapids, Mich., has published its catalog No. 22, a book of 320 pages, bound with cloth covers, and illustrated by many photographs. This company's complete line of woodworking machinery and a few metal working machines, such as engine lathes and die filers are included. The features of each machine are described in detail, and complete specifications are given. A large part of the book is devoted to pattern shop equipment.

Pamphlets Received

Alloy Steel. The International Nickel Co., 67 Wall St., New York, N. Y., has published Bulletins Nos. 6 and 7 dealing with nickel steel. The first is entitled "Alloy Steel Reduces Die Block Costs." This is a four-page 8½x11-in. bulletin, in which are tabulated the comparative costs of producing commercial forgings with carbon-steel and nickel-steel die blocks. Bulletin No. 7 is entitled "Automobile Design and Automotive Steels." This is a twelve-page 8½x11-in. bulletin, in which the factors influencing the design of the modern motor car and the selection of suitable steels to be used in its construction are outlined. Typical calculations illustrating the methods used to determine stresses and factors of safety in various automotive parts are also given in some detail.

News of the Week

Higher Taxes, More Production and Greater Economy the Plan of New French Industrial Control

Foreign labor crowding in as employment increases

By Our Paris Correspondent

At the present time the questions of debt settlements and foreign loans in France are side-tracked for more important subjects of securing budget and treasury funds by direct and indirect immediate taxation, the raising of the turnover tax to a uniform 2 per cent, a revision of the customs tariff regime, the raising of passenger fares and freight rates on the state railways, the increasing of postage rates and other taxes.

The entire plan is barely outlined but the worker is to be encouraged to produce at high speed and industry is to be relieved, if not of taxation burdens at least of fiscal complications, while the wage earner is to have exemption of 10,000 francs instead of 7,000 francs in the income taxation.

French foreign trade has slumped as a result of the disturbed financial and political situation since the first of the year. Stocks of raw materials from abroad, in many cases, have not been renewed and will now have to be imported at higher exchange rates.

The mercurial drop of the franc in the last days of July brought a stealthy but rapid purchasing campaign in many lines. Many of the large Paris stores cleaned their counters of seasonable goods and the reflex in wholesale lines reached notable proportions.

The building hardware, bolt and nail trades immediately sought to save the situation and put prices on a basis of 40 francs to the dollar with discounts or majorations of 2½ per cent, accordingly as the dollar might go up or down at the rate of another franc unit. Manifestly this was only a make-shift but it remained for these branches of the metal trades to show the way by which prices might be co-ordinated with existing conditions.

French imports of "materials necessary to industry" for the first six months of the year reached 20,349,207,000 francs, an increase of 7,711,801,000 francs over the same period last year. Total imports for the period were in excess of ten billion francs of former figures. Total exports, however, increased five billion francs but did not balance imports by 509,500,000 francs.

It is proposed to raise the customs tariff on a coefficient basis which will take into consideration the index number of general living costs, varying from time to time as does that figure. On this basis tariffs will rise accordingly.

The American trade showing with France for the six month period is 2,283,118,000 francs in exports to France, and 1,360,654,000 francs in exports from France to the United States. French imports from Great Britain increased, as did those from Germany and even Belgium.

Imports of machinery, machinery parts and tools and hardware from the United States have averaged 57,482,200 francs a month since the first of the year, which is an increase of nearly twenty million francs a month as compared with the figures of last year.

False Prosperity

Of the French industrial situation in general it has the fictitious aspect of being prosperous, with its production about the cheapest in price throughout the world, but only because it is sold with profits figured in depreciated francs. When stabilization intervenes France will have a hard time in the world export market in which she has been making headway. Exports will diminish and imports will increase for no one believes that France can produce that which can be turned out by United States manufacturers by quantity machine methods at the price. At that time France will have to seek a solution for the employment of the large numbers of foreign workers who have flocked here now when manual labor is needed. Both Herr Schacht, who was responsible for the rentenmark which led to the gold mark in Germany, and Herr Schoeffer, the German minister of public economy, have been in Paris recently. The latter is concerned for fear that with the franc stabilized at a low value—say from three to five cents—France will dump her cheaply manufactured goods on world markets to the detriment of German manufacturers, and ultimately to herself.

It is reported that the accord between steel makers in Germany, France, Belgium and Luxembourg, which has been long pending was settled on Aug. 12. It foresees the joint international control of production and distribution of steel products for each of the countries in question whereby competition will be eliminated. The measure, though not all-embracing, points the way to formidable efforts of Europe in the metal trades of the world.

The French market in all metal lines is still unsettled. Steel sheets and strips reached their highest quoted prices last week, delivery delays running from two to four months. Export prices in some cases are based on the gold value of the franc on the date of delivery, proving once again the impossibility of taking profitable business for long delivery dates as things now are.

Orders for freight cars are looming up from the Algerian railways and the P-O company in France, but manufacturers are adamant on the matter of quotations being but temporary for the day and by no means assured that they will hold until orders are actually placed.

Metallic construction materials and boilers have experienced a slowing down in demand. Boilermakers are wanted in many plants. Machinery and tools continue their export increases with the Belgian-Luxembourg Union.

Imports of sewing machines from Great Britain and Germany are holding up and the infant French industry is finding competition almost insurmountable. Exports of electrical machinery are still increasing.

Automobile export is almost on a par with that of the first half of last year but there has been a falling off of imports. There is a slowing down in production, nevertheless, due to American competition in the French market. Efforts to reduce production costs and overhead have met with success, the high cost of semi-raw materials being the determinate factor which prevents the situation from being considered satisfactory. A blow will be given the automobile industry by the new taxation bill of the Poincaré government when annual taxation on a Ford for instance, will amount to something like twelve hundred francs—not much below the price the vehicle sells for in America at normal exchange. The French low-powered, high-speed motors will feel it less, but the popular Citroen and Renault, the two mass production units here, will find their annual tax increased 50 per cent.

The labor market is still absorbing virtually all available labor. The sum total of unemployed as per government reports of June 30 did not exceed ten thousand, including agricultural labor. The secretary of the International Federation of Labor has stated that France is now absorbing the foreign Middle-European labor element which formerly went to the United States. With nearly three million foreign laborers in France it may be taken for granted that the saturation point is fast being reached, also that it were better if they were supplanted so far as possible with more and more efficient machinery.

W. P. McCracken, Jr. Takes Over Civil Aviation

William P. McCracken, Jr., of Chicago, has assumed his duties as Assistant Secretary of Commerce in charge of civil aviation activities. Mr. McCracken received this appointment to the newly created office last week and immediately accepted.

He is a graduate of the University of Chicago and is prominent in legal and political circles in Illinois. He served in the Army Air Service during the war and is thoroughly familiar with the problems of aviation, military and civil.

After leaving the Air Service, Mr. McCracken returned to the practice of law, and also has devoted a large part of his time to the national development of civil aviation. He has been one of the governors of the National Aeronautic Association since its organization. He is secretary of the American Bar Association, and for many years has been chairman of its committee on the law for aeronautics and in that capacity has devoted a great deal of time to the development of a law for civil aviation. He took an important part in the prepraration of the new Air Commerce Act recently enacted.

He is counsel for and has devoted much time to developing the business and operations of the National Air Transport Co. He has made extensive studies in the promotion of traffic business for aerial transport. Mr. McCracken has a through knowledge of all phases of civil aviation and is known throughout the country as one of the leading men interested in and who have been responsible for its development up to this time. He is also thoroughly acquainted with the development of civil aviation abroad and participated in the world survey of civil aviation recently made by the committee appointed by the Secretary of Commerce in the preparation of the report published by that committee to promote an understanding of the problems of civil aviation.

He is chairman of the aviation committee of the American Legion for the Department of Illinois; chairman of the aviation committee of the Hamilton Club of Chicago; and is a member of the Chicago Aero Commission.

Steel Treaters Plan Series of Shop Inspections

Plant inspection will form a very important feature at the convention of the American Society for Steel Treating and the National Steel and Machine Tool Exposition, during the week of Sept. 20 at Chicago. Theodore E. Barker, president of the Accurate Steel Treating Co., Chicago, is chairman of the inspection committee, which has prepared the following program:

On Trip No. 1, the party will visit Harvey for the inspection of the Buda Co., manufacturer of heavy duty motors for trucks. The departments to be visited there will be the heat-treating, forging and foundry. On the same trip an inspection will also be made of the Harvey plant of the Wyman-Gordon Co.

An optional trip, Trip No. 2, is offered on the same day to the Lewis Institute and the Miehle Printing Press and Manufacturing Co., where the heat-treating, tool hardening, screw machine, gear and cam-cutting, drill press, cylinder turning and grinding departments will be observed. Another trip includes the inspection of the American Forge Co., and the Tractor Works of the International Harvester Co.

On Trip No. 4 members will visit the West Pullman Works of the International Harvester Co., and inspect the roller-bearing manufacturing processes from the raw material to the finished product. The second optional trip, Trip No. 5, for that day calls for a visit to Indiana Harbor to inspect the Youngstown Sheet and Tube Co., where will be shown the production of metallurgical coke and the processes by which the by-products are recovered and refined; modern blast furnaces, Bessemer and open-hearth steel reduced in ingot form; soaking pits, blooming and billet mills and welding of pipe.

The Inland Steel Co. will show the visitors a complete modern mill for the production of rails, bars and special shapes, together with a fabricating plant.

The third optional trip, Trip No. 6, includes a visit to the Danley Machine Specialties Co., Inc., devoted to the production of die sets, leader pins and bushings.

Trip No. 7 will be a visit to the plant of the Pettibone-Mulliken Co., where the electric furnaces will produce manganese steel together with the heat-treatment and fabrication of the same. This plant is devoted to the production of heavy railway equipment, including frogs, switches, etc.

Trip No. 8 will include a visit to the Western Electric Co., where the following departments will be open to the inspection to the visitors: Copper wire and rod mill; rubber plant; lead cable department; toolmaking department; automatic machine switching laboratory.

Trip No. 9 will be to South Chicago. The party will first be conducted through the plant of the Interstate Iron and Steel Co., where the manufacture and rolling of open-hearth alloy steel and bars and billets will be shown. From there they will go to the South Works of the Illinois Steel Co., a plant devoted to the production of rails, shapes and plates by the open hearth, electric and duplex processes.

The following day the visitors will inspect the modern shops of the Illinois Central R.R. and also the plant of the Pullman Car Works. Trip No. 11 calls for the inspection of the Columbia Tool Steel Co.'s modern plant at Chicago Heights. From there the party will go to the American Manganese Steel Co. for the observation of manufacture and heat treatment of manganese steel castings.

A party will be taken through the modern die block manufacturing plant of A. Finkl & Sons, and from there through the plant of the Aetna Ball Bearing Co. Trip No. 13 includes a trip to Armour Institute of Technology.

Plan More Agitation for Metric Legislation

While experienced legislative observers are convinced that the evidence submitted at the last session of Congress by those opposing any compulsory use of the metric system of weights and measures is sufficient to prevent the passage of any such proposal, the advocates of a metric law have laid plans for a further effort.

The bill, which is to be pushed at the next session, is of the entering-wedge variety. It provides "that the U. S. Department of Commerce is authorized to establish commodity quantity units for general use in merchandising after 1935, standardizing the yard to the meter, the quart to the liter, the pound to five hundred grams decimally divided."

The House Committee, after having listened attentively to exhaustive arguments on each side of the question, was so opposed to the original bill and to the various compromises suggested, in spite of the very great pressure brought to bear on it, that it is not likely to look with favor on a repetition of the presentations at the second session of the present Congress. For this reason, activity is expected on the Senate side, where Senator McKinley, of Illinois, is sponsoring the measure.

It is much less difficult on the Senate side to arrange for hearings than is the case with House committees. Oftentimes, all that is necessary is the request of one Senator who, likely as not, is made chairman of a sub-committee of his own choosing. Since Senator McKinley is chairman of the Committee on Manufactures, which has jurisdiction, he is in a position to start hearings at any time he chooses.

To get a favorable report from the committee, however, will be a different matter, as the committee's membership includes among others Mr. McNary, of Oregon; Mr. McLean, of Connecticut; Mr. Metcalf, of Rhode Island; Mr. Edwards, of New Jersey and Mr. Tyson, of Tennessee.

Senator McNary presided at the metric hearing held in 1921. He decided the proposed legislation would be very unwise. In fact, the only members of the committee likely to vote to support metric legislation would be Senator McKinley, Senator La Follette, of Wisconsin, and Senator Wheeler, of Montana.

No A.S.T.M. Group Meeting This Fall in Detroit

The American Society for Testing Materials has decided not to hold the usual group committee meetings which were scheduled to be held in Detroit this fall. It was found that only nine of the committees of the society could meet at that time and place, since many of them found it advisable to meet with other conventions being held in the fall. Rather than to hold meetings which would not render the best of service to the members, it has been decided to wait until the Spring meeting.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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AS ONE glances over the week's business news, the view that greets his hindsight is altogether satisfactory.

The Federal Reserve Board reports a gain of 5.4 per cent in July retail trade, as compared with last year, and chain-store sales continue to increase.

The net earnings of the railways for the first six months of the year will approximate $500,000,000 which is a record.

Sales of farm implements in 1925 were $332,000,000 against $277,000,000 in 1924, the increase being $55,000,000, or more than 20 per cent.

Savings Bank deposits continue to grow amazingly, and the life insurance in force exceeds $65,000,000,000.

Farmers' business organizations now number 9,463 as against 4,683 in 1915, and they have 2,500,000 members, which is five times their membership ten years ago.

With the U. S. Steel Corporation and General Motors in the lead, most big corporations report phenomenal earnings, and car-loadings are still making new records.

If our foresight were as good as our hindsight, we should be able to see whether the coming year will better this phenomenal showing.

But fortunately or unfortunately, we can't see very far ahead, and about the only thing we can be certain of is that we won't always be as prosperous as we are at present.

The devotees of the cycle theory realize this. About a year ago they were predicting an early ending to the cycle upon which we were then moving. But the end has not come yet, and although it is obviously nearer there are some who now say that we will never see really hard times again now that the country has become so rich and the existence of the Federal Reserve Banks has made money panics impossible.

This willingness to believe that prosperity is a permanent condition is one of the things that make experienced people careful, for they know that business moves in cycles which must end some time although no one can tell how long they will last. This is why so many feel that the present situation is an unreal one. They think it is the result of over-stimulation by super-salesmen. They admit that the Federal Reserve Board is right in asserting that our industrial production has broken all records, but they claim that these super-salesmen have sold much that was not needed to buyers who have mortgaged their future under some installment plan, and that business will be very much curtailed when the piper insists upon being paid.

The number of those who take this reactionary view was noticeably increased last week, and their caution was vindicated by the action of the Federal Reserve Bank of New York on Thursday, when it advanced its discount rate to 4 per cent.

What's Doing in Industry

August has so far shown no serious let-down in volume of business from the amount done in July. There has been some readjustment of the market as a whole so that where orders and inquiries have decreased in one field they have increased in another. Railroad and automotive orders and inquiries seem to be fewer this week, but industrials and agricultural machinery building equipment have filled their places.

The Mid-West has continued fairly active at most points. Reports from Milwaukee say that many inquiries are coming in. Orders for automotive equipment have been frequent this week. The prospects for the month have aroused considerable enthusiasm. Chicago reports some decline in business within the last few days but still finds the month better than was expected and comparing favorably with July. Railroad buying is said to have been fairly active. Some automotive and railroad buying has been done, also, in Detroit but the market was fairly quiet. Inquiries have been coming in rather constantly, however. An optimistic view of business conditions has been taken by Buffalo, where the August sales this year have been greater than those for July and those for either of the two months last year.

Industrials now form the backbone of sales in Cincinnati. Replacement orders of single machines have been frequent. Cleveland has also found a market for machinery in the industrial class but a falling off in the automotive market.

Philadelphia, New York and New England have all reported fairly steady market conditions.

As a result the bell-wether securities are lower, despite the declaration of a 50 per cent stock dividend by the General Motors Corporation. Most other speculative shares have followed their lead. A recovery is of course possible, but the fever seems to be broken and most diagnosticians expect that the patient's temperature will gradually get back to normal. The advance in interest rates has also had its effect upon bonds, which have been less eagerly bought and are somewhat lower.

Sugar was quite firm, early in the week, on an excellent demand from consumers, but the fear of large deliveries on September contracts caused a reaction later. The position of sugar is manifestly better, nevertheless.

Rubber has been steadied by the belief that imports will be curtailed on Nov. 1 under the provisions of the Stevenson plan. Coffee has been stolidly maintained, although the news from Brazil indicates that planters are becoming very restive under restrictions that prevent them from selling their coffee.

In the cities as well as in many parts of the country, August is the vacation month and it is a little early to generalize about fall business. Thus far the continued decline in building operations is the only definitely unfavorable feature. Bradstreet's estimates that the expenditure for new construction in July was but $295,000,000 as compared with $339,000,000 in the same month a year ago. The F. W. Dodge Co. puts the reduction for the month at 5 per cent and all authorities agree that there has been a marked reduction in building activity. This may or may not be a harbinger of the expected reaction. It certainly means unemployment, but it may also mean that the recent disclosures have made it more difficult to sell building bonds.

In the economic news from abroad there is not much that calls for comment. The French parliament has adjourned after passing all the bills that Poincare asked for.

It remains to be seen whether he can carry out his program. Francs are meantime well below three cents again. Silver is down to 28⅛ pence, the lowest price in ten years. The cause is the report of the India Currency Commission, recommending that East India establish the gold standard in 1931. This threatened demoralization of silver is of course viewed with alarm in all silver countries.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Buffalo

There are indications that August will bring an upward turn in the machinery and machine tool trade here. With few exceptions dealers report a better trend in business for the early part of the month than was experienced any time during the month of July; and better than was the case in either July or August, 1925. The exceptions are not notable, however, and even in these cases there is an agreement that the future for fall business is exceptionally bright.

Inquiries continue to be good and much of the business that is pending is due to the fact that the interested parties cannot be gotten together at this time because of the vacation season. The demand for electrical equipment seems to lead the market here. Business from other quarters has also been brisk.

The general industrial situation is good. Most industries are working briskly, though perhaps not to capacity in most instances. There is some demand for used equipment.

Leaders expect September to be a good month. Whatever it develops they expect it to be a barometer for the balance of the autumn here.

Chicago

The first week in August, as reported by dealers in new and used machine tools, maintained the average of July business in the machine tool industry. There has been some slight decline in the volume of trade within the last few days, but not to the extent that had been generally expected. That this falling off in sales will continue for long is not thought probable by those who study the trend of the machinery market.

August, one of the least busy months of the year with dealers, has proved an exception to the rule thus far this year, but even should the business now being done by some of the leading machinery houses decline during the latter part of the month, it will compare favorably with July.

The number and the nature of the inquiries being received indicate that after the vacation period is ended there will be renewed activity. At the present time, many executives and purchasing agents are taking their annual holiday, in consequence of which a number of prospective sales are being held up pending their return.

Railroad buying continues fairly active. The C. & N. W. and A. T. & S. F. railroads are adding additional tools to their lists, a few scattering orders have come from other roads. The Nash Motors Co. of Kenosha, Wis., has recently entered the market with inquiries for several tools of standard make.

Cincinnati

Considering the fact that it was in mid-vacation season, Cincinnati machine tool manufacturers and selling agents regard business as having been better than fair in that period. There was a better demand than in the corresponding period last year, it is reported, and prospects for increased sales are decidedly brighter now than they were then.

The week's orders were well scattered and came from all sections of the country. While no one industry did a great amount of buying, practically all ordered some tools. Purchases were still confined mainly to single tools for replacement purpose, the orders received being well diversified in the matters of size and type.

A few orders were received from concerns in the automotive industries, but these were restricted to replacements and tools for experimental purposes. Railroads bought a single tool here and there, but no lists are reported as having been booked from this source. General machinists and industrial users of tools, it seems, form the backbone of the market at the present time.

During the week inquiries came in quite freely from all sections of the country and from all kinds of machine tool users. This, of course, gives encouragement to manufacturers and selling agents alike and is taken as a positive indication of a much better market in the fall.

Factory production remains as it has been for some time and it is not thought that it will be necessary to reduce output. Manufacturing conditions continue to be favorable in every way.

Cleveland

Steady buying of a wider variety of machine tools and general manufacturing equipment has come into the local market in the last two weeks. Although the orders were mostly for single pieces by general industrials some significance is placed in the fact that the manufacturers are replenishing their equipment. The feature of the new development is the absence of buying on the part of the automotive lines and a quickening of demand from general manufacturing. Die-sinking, rubber tire and metal working industries were recent buyers.

Developments within the last month and the new business in prospect has revived a feeling of optimism. The present buying activity is expected to last through September.

Announcement by the National Carbon Co., of its plans to spend several million dollars for new buildings at its Fostoria, Ohio, plant will eventually mean a large list of tools.

New England

The vacation period is slowing down production only slightly in the machinery industry in New England. Some of the larger shops in Hartford followed the established practice in closing plants for two weeks, bridging over the vacation period at the one time, but practically all of them are operating as usual this week.

There is little change in the character of buying or the complection of inquiry mail. The automotive industry is strongly represented and there is also representative business, immediate and prospective, in the electrical industry. Hand tool business is reported by manufacturers to be good. A substantial volume of buying by companies with products for ultimate use on the farm is appearing.

Second hand dealers report that inquiries are numerous and that demands cannot be supplied because of the scarcity of types of equipment sought.

Milwaukee

August bookings of machine tool orders so far represent a gain over the corresponding period in July, and the prediction is made that sales for the entire month will be comparable to the best previous month this year. Opinions of manufacturers of metal-working equipment relative to the present and future of business have been undergoing a substantial improvement in tone as the direct result of greater activity. Fresh signs are appearing almost daily to indicate a healthier demand for machinery.

Antomobile factories, of which less had been expected in the way of new business during the last half of this year, compared with 1925, are buying in such a way and making inquiry so broadly that any pessimistic comment or expectations are being abandoned. Plans embracing replacements of tools and additions to equipment are discovered to be on a much more extensive scale than the industry had been led to believe a short time ago.

Production of tools in this district is going forward at an unusually high rate for August, and is maintained close to the peak reached this year. Some plants are complaining over the inability to procure an adequate number of skilled men, and in most instances vacations are being held within the closest bounds possible without prejudicing the loyalty of labor.

Detroit

While actual sales of machinery and machine tools in Detroit and the other automobile centers in southeastern Michigan have not shown any material increase during the past week, leading representatives of machinery manufacturers report a larger number of inquiries, many of which are for sizable lists of equipment.

The market has been quiet during most of the summer after a particularly active spring. Many of the automobile plants were tooled up, and many others were awaiting announcement of their new models before going ahead with extensions in equipment.

Packard has just installed a new honing machine which hones the journals of the shaft. Paige has strengthened its cylinder finishing department by the installation of several costly automatic machines.

All plants in Detroit are buying some tools, and while sales are somewhat spotty the number of inquiries indicates a gradual pick-up in the field all along the line.

Railroads are more active than they have been, especially the Pere Marquette, although the Michigan Central is buying some shop equipment.

Philadelphia

Little if any change was noted in the underlying business conditions in the machinery and machine tool industry in the Philadelphia area this week compared to the situation two weeks ago.

The producers who two weeks ago reported an upturn in orders for the first six months of 1926 compared to the corresponding period of last year, said there was nothing now to indicate a change in their estimate that the full twelve months of this year will show a larger volume of business than the full period of 1925. Some inquiries have been received from industrial centers which leads to a hopeful outlook in the minds of most dealers. Railroad buying from the carriers in the immediate vicinity of Philadelphia has not been large.

Dealers and manufacturers of small tools look at the situation hopefully, particularly with regard to the prospective buying from the agriculture centers which have not been in the market for tool buying for upward of two years. Business among producers of tools for locomotive repairing has been somewhat spotty.

New York

The New York market has changed but little during the past week. There has been some activity though not evenly distributed throughout the industry. The greatest activity seems to be found at present in industrial machinery. Present buyers include manufacturers of hardware, electrical goods and other metal products.

Some of the continued reduction in sales during August over those of July can be attributed to both the unusually hot weather this week and the fact that many buyers are away on vacations. Some orders are held up pending only the approval of officers who are still away.

The railroads have placed fewer orders this week than last but this does not mean more than a temporary slackening of activity. Orders are expected to continue through the month at a rate sufficiently high to set a fair general average in railroad buying for August.

Inquiries are appearing regularly but purchasers are slow to act on quotations submitted.

Second-hand machinery buying continues at a fairly steady rate and the market is to be considered normal although it has not progressed a great deal.

Committee to Facilitate World Trade

A declaration by the business men of the world, containing principles designed to govern the treatment of foreign business, foreign rights and foreign capital is proposed by an American Committee to the International Chamber of Commerce, as an important part of a plan looking to the removal of the trade barriers now hampering international commerce.

This American Committee is one of several now working in the various countries toward a solution of the trade barrier problem. All of the committees are reporting to a Central Trade Barriers Committee at the headquarters of the international chamber in Paris, which will present the subject at the next meeting of the International Chamber of Commerce at Stockholm, in June.

The six conditions listed by the American Committee as constituting a hindrence to the international exchange of goods are: decline of purchasing power, depreciation of currencies and instability of exchanges, political instability and lack of security, discrimination against and aversion to foreign capital and trade, increase of customs barriers through the creation of new political entities, entrance of governments into spheres of industry and trade hitherto left to private business.

Smaller Profits Made in Manufacturing

A study of manufacturing corporation incomes made by the National Industrial Conference Board, covering through 1923, indicates a downward trend in net profits. While in 1919, 9.28 cents out of every dollar of the manufacturer's gross receipts represented net income, his net income amounted to only 6.35 cents per dollar of gross receipts in 1923.

It is possible that increased manufacturing efficiency since that time may have increased the net income. Gross receipts have increased during the period from $45,704,873,968 to $48,686,639,790. The increase in volume of business is greater than indicated, however, because of the declining price level during these years. Those industries which operate on a small scale have shown the greatest losses, according to the report.

Mid-Continent Iron Co. Will Liquidate

After five years of inactivity, the Mid-Continent Iron Co., Midco, Carter County, Missouri, has decided to liquidate its holdings consisting of 350 acres of land, steel buildings, rolling stock and locomotives, cranes and hoists, power plant and boilers, sawmill, ore and stone crushers, chemical and dryer plant, charcoal retorts, machine shop, blast furnace and auxiliary equipment.

Midco once had a population of 2,000 when the corporation was in operation. The government took over the operation of the plant during the war. After the war the plant was forced to close because of the depression. A resident manager has been placed on the grounds to handle the property.

Transformer Contracts Awarded

A contract for twelve water-cooled 21,666-kva. transformers with the necessary high-tension oil circuit breakers, lightning arresters and substation equipment for use at Muscle Shoals has been awarded to the General Electric Co., by the Corps of Engineers. The bid of that company was $799,000. The transformers are to convert electricity at 11,500 volts to 110,000 or 154,000 volts. The new equipment is to be completed in 230 days.

Carnegie Institute Appoints Research Fellows

Thirteen graduates of colleges and universities have been appointed research fellows to conduct an extensive program of studies in mining and metallurgy at the Carnegie Institute of Technology, during the coming year. The work will be carried on by the department of mining and metallurgical engineering, in co-operation with the Pittsburgh station of the U. S. Bureau of Mines and under the direction of two advisory boards of engineers and business men representing the mining and metallurgical industries.

Of the thirteen investigators, five will study problems in metallurgy and eight have been assigned to carry on research in problems relating to coal mine engineering. The program of metallurgical studies will be supervised officially by an advisory board of Pittsburgh district steel men and engineers. The coal mining investigations will be made under similar conditions with an advisory board of coal operators and mining engineers. Senior investigators to assist the research fellows will be furnished by the Bureau of Mines.

Joint Session to Be Held by Machine Shop Practice Division of A.S.M.E.

The machine shop practice division of the American Society of Mechanical Engineers will hold a session during the annual convention of the American Society for Steel Treating and the National Steel and Machine Tool Exposition to be held on the Municipal Pier, Chicago, during the week of Sept. 20.

Due to the large exhibit of machine tools and the many members of the A.S.M.E. in attendance, a joint session will be held. This meeting will be set for either Thursday or Friday, Sept. 23 or 24, at the Drake Hotel.

The program arranged for that meeting is as follows:

"Drop Forging Hammer Anvils," by Eugene C. Clark, Chambersburg Engineering Co., Chambersburg, Pa.

"The Possibilities of Standardizing Design Details in Plants Manufacturing Special Machinery," by H. K. Keevir, McDonald Machine Co., Chicago, Ill.

"Inspection Methods," by E. D. Hall, manufacturing department, Western Electric Co., Hawthorne Plant, Chicago, Ill.

"Foremanship Training," by Hugo Diemer, LaSalle Extension Institute, Chicago, Ill.

What the Railroads Are Doing

Although car and locomotive companies are still suffering from a dearth of orders, the situation shows some sign of brightening. The New York Central is expected to place orders in a week or so for engines. Its inquiry was for 25 locomotives, but it may purchase more. The Seaboard Air Line is in the market for 35 engines, and the Burlington and the North Western are both said to be figuring on substantial purchases. The only car inquiry in the market, of any size, is for 2,000 refrigerator cars.

The American Locomotive Co. and subsidiaries report for the six months ended June 30 a net profit equal, after dividends on the 7 per cent preferred stock to $3.10 on 770,000 outstanding shares of no par common. The statement includes the operation of the Railway Steel Spring Co. from May 14, the date of its acquisition by the American Locomotive Co.

Locomotives in need or repair on July 15 totaled 9,799 or 15.5 per cent of number on line, an increase of 481 locomotives over the number July 1 and decrease of 1,515 under the same date last year. Of this number needing repair, 5,254, or 8.4 per cent, required classified repairs, an increase of 290 compared with July 1, while 4,455, or 7.1 per cent needed running repairs, an increase of 191.

The Chesapeake & Ohio R.R. has awarded contracts for repairing 25 mallet type locomotives to the following shops: Ten at the American Locomotive shops in Richmond, ten at the Newport News Shipbuilding and Dry Dock shops at Newport News, and 5 at Erie Railroad shops in Hornell.

Equipment orders were light in the past ten days, the principal contract being for 500 hopper bodies for the Chesapeake & Ohio, to be built by the Richmond Car Works. The Chicago, Rock Island & Pacific ordered 188 gondola bodies from the Bettendorf Co., and the Alaska Railroad two Mikado locomotives from the Baldwin Locomotive Works.

Present inquiries include 2,000 refrigerator cars for the American Refrigerator Transit Co. and 35 locomotives for the Seaboard Air Line. The New York Central is inquiring for 25 locomotives, while the Chicago, Milwaukee & St. Paul is asking for prices for modernizing ten observation cars and two buffets.

Signal orders placed in the week included contracts from New York Central; Chicago, St. Paul, Minneapolis & Omaha; Chicago & Alton, and New York, New Haven & Hartford for various apparatus, awarded to General Railway Signal Co. The New York, Chicago & St. Louis contracted with the Union Switch & Signal Co., a Westinghouse Air Brake subsidiary, for materials for installation on 170 miles of its track from Conneaut, Ohio, to Arcadia, Ohio; also for an electric interlocking device to be installed at North East, Pa.

Chesapeake & Ohio Ry. has awarded to the Richmond Car Works a contract to dismantle 500 70-ton hopper bottom gondola cars and to repair trucks and build new bodies. Cost averages $1,422 per car and aggregates $711,000. Delivery of completed cars will begin in three months at the rate of ten cars a day.

A canvass made by the General American Tank Car Corporation indicates that there will be heavy railway equipment buying in the fall. The purchase of railway equipment now looms large. Investigation points to a tremendous amount of business for the industry this fall. Business so far this year has been satisfactory and this company has several months' business booked ahead. The company is now developing some new equipment.

Equipment orders placed in the past week included 100 cane cars for the Cuban

American Sugar Co., with the Gregg Co., and 100 cane cars for the General Sugar Co., with the Magor Car Corporation, the Atchison, Topeka & Santa Fe has ordered 40 locomotive tenders from the Baldwin Locomotive Works.

The Richmond, Fredericksburg & Potomac contemplates the purchase of six locomotives, including four Pacific type. The Pere Marquette is in the market for 25 all-steel hopper coal cars.

The General Railway Signal Co. has received orders for various signal devices and interlocking machines from the Missouri Pacific, the Texas & Pacific, the Chicago & Western Indiana and Morgan's Louisiana & Texas.

The Union Switch and Signal, a Westinghouse Air Brake subsidiary, has received orders for similar materials for the Central Railroad of New Jersey, the Wabash, the Pennsylvania and the Seaboard Air Line.

Business Items

The Magnolia Metal Co., formerly at 113 Bank St., New York, N. Y., has moved to 75 West St., of that city.

The Crucible Steel Co. of America, New York, N. Y., has announced the opening of a branch office at 337 Whitehall St., Atlanta, Ga.

The General Aircraft Corporation, Detroit, Mich., has been organized by Clifford C. Jones to manufacture airplanes and airplane motors.

The Kearney & Trecker Corporation has moved its Indianapolis office into larger quarters at 616-617 Continental Bank Bldg., Indianapolis, Ind.

The Ludlum Steel Co., Watervliet, N. Y., is planning to change over the remainder of its melting furnaces from manual to automatic electric control.

The Roberts Tool & Supply Co., Syracuse, N. Y., has recently been appointed district representative for the products of the Foote Bros. Gear & Machine Co.

The plant of the Manitoba Steel Foundries, Ltd., at Selkirk, Manitoba, was recently destroyed by fire, the loss being officially estimated at close to $400,000.

The Weston Foundry and Supply Co., New Britain, Conn., has been incorporated by Charles A. Danberg, Walborg W. Danberg and Edward A. Danberg, for handling general foundry work.

The American Iron and Machine Work Co. has opened its new plant at 518 North Indiana Ave., Oklahoma City. The headquarters of the company have been transferred to this city from Tonkawa, Okla.

The Harry N. Glynne Co., New Haven, Conn., has been incorporated by Edward S. Parks, Harry N. Glynne and Roy E. Sheldon, to engage in the manufacture and sale of machinery. The officers are: Harry N. Glynne, president and treasurer; and Roy E. Sheldon, secretary.

The Malleable Iron Castings Co., New Haven, Conn., has been organized. The officers are: Charles R. Treat, president; James A. Walsh, vice-president; Frank C. Tuttle, secretary; and William E. Eccles, treasurer. The directors are: Thomas Prescott, Walter Hodgkinson, Frank C. Baldwin, Howard P. Brooks, Rene Pontot.

Frank Wheeler & Son Inc., Meriden, Conn., has been incorporated by Alfred P. Wheeler, E. W. Robinson, M. H. Wheeler, and Donald Robinson, to engage in the manufacture of metal goods, tools, screws and machine products. The officers are: Alfred P. Wheeler, president; E. W. Robinson, vice-president; and Donald P. Robinson, secretary and treasurer.

The Hewitt Machine Co., of Neenah, Wis., has acquired the business of the Menasha Machine Co. of Menasha, Wis., including stock, equipment, good will, etc. The Hewitt company will build a shop addition to accommodate the Menasha company's operations. The Menasha company was owned by J. F. Hawley and Kai Schubert. Mr. Hawley will move to Chicago, and Mr. Schubert becomes a partner of John W. Hewitt and Olaf Myhre in the Hewitt company, which is being incorporated to conduct both businesses.

The General Electric Co. has transferred from the Fort Wayne to the Erie works, the manufacture of power transformers in sizes from 501 to 3,500 kva., inclusive. The design of these transformers will be under the immediate direction of C. N. Brubaker, who has been appointed engineer of the transformer department, Erie works. He will have charge of all engineering work on transformers carried on at Erie, under the direction of the general transformer engineering department at Pittsfield.

The engineering and manufacturing of distribution transformers up to and including 500 kw. at Pittsfield, has been organized as a department under the direction of E. A. Wagner, who has been appointed managing engineer of the distribution transformer department of the Pittsfield works. E. D. Treanor has been appointed designing engineer of the distribution transformer department at the Pittsfield works, and R. H. Chadwick has been appointed engineer of the transformer department of the Fort Wayne works.

Personals

R. H. RICH has been appointed advertising manager of the Cleveland Automatic Machine Co., Cleveland, Ohio.

JOSEPH G. STADELMAN has been appointed general manager and first vice-president of the Harris Brothers Co., Chicago, Ill.

R. J. PAUL, of 3115 Washington Blvd., St. Louis, has been appointed district sales agent for the Burke Electric Co., of Erie, Pa.

E. B. MOFFET has been appointed general superintendent of the Delaware, Lackawanna & Western R.R. He was formerly assistant to the vice-president and general manager.

MAURICE ROTHSCHILD has become chairman of the board of directors of the Republic Motor Truck Co., Alma, Mich. He was formerly general manager and first vice-president of the Harris Brothers Co.

JAMES W. HOOK, president of the Geometric Tool Co., New Haven, Conn., and formerly president of the Allied Machinery Co., New York, has been elected a director of the First National Bank, New Haven, Conn.

AUGUST A. BOLIK has been appointed sales engineer for the E. W. Bliss Co., Brooklyn, N. Y. His headquarters will be at Cleveland, Ohio. He was formerly press designer for the Cleveland Punch and Shear Works Co.

EDWARD S. BLOOM has been elected president of the Western Electric Co., to succeed Charles C. DuBois who will continue as chairman of the board of directors. Mr. Bloom is now a vice-president of the American Telephone & Telegraph Co.

H. G. DAVIS is now a member of the sales organization of the Foote Bros. Gear & Machine Co., Chicago, Ill. His territory will include the north side of the city of Chicago and its suburbs. He was formerly associated with the Pfaudler Co., Milwaukee, Wis.

WILLIAM H. ALLEN has been appointed representative of Charles H. Besly & Co., Chicago, Ill. His headquarters will be at Buffalo, N. Y., and his territory will include northern New York and Pennsylvania. He was formerly connected with the Fellows Gear Shaper Co., and also was sales manager for Kearney & Trecker.

WILLIAM MACGREGOR and S. F. COURTER, have been appointed general sales managers of the Carborundum Co., Niagara Falls, N. Y. They will assist George R. Rayner, vice-president in charge of sales. Mr. MacGregor was formerly sales manager of the coated abrasive division of the company and Mr. Courter was formerly in charge of the Philadelphia office.

A. J. NESBITT, of Nesbitt, Thomson and Co., Canadian investment bankers, has been appointed president of the Northern Ontario Light and Power Co., Ltd. Mr. Nesbitt is also president of the Canada Northern Power Corporation, Northern Canada Power Co., East Kootenay Power, Ottawa-Montreal Power Co. and a number of other power companies distributed through the provinces of Ontario, Quebec, Manitoba and British Columbia.

Obituaries

WILLIAM B. REED, vice-president and general sales manager of the H. B. Smith Co., Westfield, Mass., died on Aug. 4. He was 57 years old.

Forthcoming Meetings

Industrial Conference. Ninth annual industrial conference on human relations, under auspices of Young Men's Christian Associations, Silver Bay, Lake George, Aug. 26 to 29.

American Railway Tool Foremen's Association. Annual convention, Hotel Sherman, Chicago, Sept. 1, 2 and 3. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foremen's Supply Association. Annual exhibit in connection with the annual convention of the American Railway Tool Foremen's Association, Chicago, Sept. 1, 2 and 3.

Machine Tool Exhibit. Sixth annual exhibition of machine tools at the Mason Laboratory, Yale University, under the auspices of the New Haven Section, A.S.M.E., the mechanical engineering department of the Sheffield Scientific School, and the New Haven Chamber of Commerce, Sept. 7 to 10. Administrative office, New Haven Machine Tool Exhibit, 400 Temple St., New Haven, Conn.

International Railway General Foremen's Association. Annual convention, Hotel Sherman, Chicago, Sept. 7 to 10. William Hall, secretary, 1061 West Wabash Ave., Winona, Minn.

American Society for Steel Treating. Eighth national steel and machine tool exposition, Municipal Pier, Chicago, Sept. 20 to 24. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Society of Automotive Engineers. Annual production meeting, Hotel Sherman, Chicago, Sept. 21, 22 and 23. John Warner, manager of meetings department, 29 West 39th St., New York.

American Foundrymen's Association. Second international foundrymen's congress, Detroit, Sept. 27 to Oct. 1, under the auspices of the American Foundrymen's Association. R. E. Kennedy, secretary, 909 W. California St., Urbana, Ill.

National Association of Manufacturers. Thirty-second annual meeting, Waldorf-Astoria Hotel, New York, Oct. 5, 6 and 7. George S. Boudinot, secretary, 50 Church St., New York.

American Gear Manufacturers Association. Semi-annual meeting, Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 14, 15 and 16. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

National Safety Council. Fifteenth annual safety congress, Detroit, Mich., Oct. 25 to 29. A. A. Mowbray, director, 108 East Ohio St., Chicago.

American Welding Society. Eighth annual fall meeting, in conjunction with International Welding and Cutting Exposition, Broadway Auditorium, Buffalo, N. Y., Nov. 16 to 19. Secretary's headquarters, 29 West 39th St., New York City.

The Weekly Price Guide

Rise and Fall of the Market

IRON demand is confined to small-lot buying with prices firm, particularly on No. 2 fdry. So. at Birmingham; in the Eastern states basic pig iron is active. Scrap continues to advance. Steel prices are firm with little tendency to change except in an upward direction. The principal hot-rolled products are quoted at a minimum of $1.90 per 100 lb., Pittsburgh mill, with a maximum of $2.10 on small lots of shapes and bars. Plates are moving in slightly smaller volume with the price at $1.90 per 100 lb. flat f.o.b. mill. Among the outstanding price advances of the week were those in fabricated brass and copper at New York and Chicago warehouses, zinc sheets at Chicago, purchasing prices of scrap copper among New York dealers and coke at Connellsville.

(*All prices as of Aug.* 13)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.19
Northern Basic	20.39
Southern Ohio No. 2	21.39
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	27.37
BIRMINGHAM	
No. 2 Foundry	21.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	28.67
Basic	21.26
CHICAGO	
No. 2 Foundry local	21.75
No. 2 Foundry, Southern (silicon 2.25@2.75)	25.05
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	19.76
Basic	19.76
Bessemer	19.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.00@5.25
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No 10	2.25@2.30	3.89	3.15	3.50
No. 12	2.30@2.35	3.94	3.20	3.55
No. 14	2.35@2.40	3.99	3.25	3.60
No 16	2.45@2.50	4.09	3.35	3.70
Black				
Nos. 18 to 20	2.90@2.95	4.30	3.65	3.90
Nos. 22 to 24	2.95@3.00	4.35	3.70	3.95
Nos. 26 and 27	3.00@3.05	4.40	3.75	4.00
No. 28	3.10@3.15	4.50	3.85	4.10
Galvanized				
No. 10	3.20@3.30	4.65	4.00	4.25
Nos. 12 to 14	3.30@3.40	4.75	4.10	4.35
No. 16	3.45@3.55	4.90	4.25	4.50
Nos. 18 to 20	3.60@3.70	5.05	4.40	4.65
Nos. 22 to 24	3.75@3.85	5.20	4.55	4.80
Nos. 26 and 27	3.90@4.00	5.35	4.70	4.95
No. 28	4.20@4.30	5.65	5.00	5.25

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

Thickness — B.W.G. and Decimal Fractions		Outside Diameter in Inches — ⅛	¼	⅜	½	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	7.00	6.00@7.50	4.65†
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60@65%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, 1/16@¼-in. thick. †F.o.b. cars.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.75
Tin, 5-ton lots, New York			66.25
Lead (up to carlots) E. St. Louis	8.75	New York	9.50
Zinc (up to carlots) E. St. Louis	7.32½	New York	8.25

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	17.00	20.50	17.00
Copper sheets, base	23.00	23.00	23.00
Copper wire, base	19.75	20.00	16.50
Copper bars, base	22.62½	22.62½	22.50
Copper tubing, base	25.00	25.00	25.00
Brass sheets, base	19.37½	19.37½	19.37½
Brass tubing, base	24.25	24.25	23.75
Brass rods, base	17.12½	17.12½	17.12½
Brass wire, base	19.87½	19.62½	19.87½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	28.00	27.00	27.02
Zinc sheets (casks)	13.25	12.55	12.01
Solder (½ and ½), (case lots)	41.00	40.00	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			80 00
Commercial genuine, intermediate grade			55 00
Anti-friction metal, general service			30 50
No. 4 babbitt (f.o.b.)			14.75
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 31 00	Electrolytic 38.00	Shot	32.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00
Cold rolled sheets (base)			50 00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	12.50 @12.75	11.25	11.50@12.00
Copper, heavy, and wire	11.75 @12.37½	11.50	11.00@11.50
Copper, light, and bottoms	10.00 @10.50	9.75	10.00@10.50
Heavy lead	7.62½@ 7.87½	6.75	7.25@ 7.75
Tea lead	5.50 @ 6.00	4.75	6.00@ 6.50
Brass, heavy, yellow	7.00 @ 7.50	7.25	7.50@ 8.00
Brass, heavy, red	9.50 @10.00	9.50	9.00@ 9.50
Brass, light	6.00 @ 6.25	6.00	7.00@ 7.50
No. 1 yellow rod turnings	8.25 @ 8.75	8.00	7.75@ 8.25
Zinc	4.50 @ 4.75	4.50	4.50@ 5.00

TIN PLATES—American Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	6.95	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13@0.17½	$0.18	$0.15
Cotton waste, colored, per lb.	.10@ .14	.14	.12@.17
Wiping cloths, washed white, per lb	.17½	36.00 per M	.15
Sal soda, per 100 lb. keg	2.05	2.25	2.75*
Roll sulphur, per 100 lb.	3.60†	3.50	4.25‡
Linseed oil, per gal., 5 bbl. lots	.93	1.05	.94
Lard cutting oil, 25% lard, per gal.	.55	.50	.48
Machine lubricant, medium-bodied (55 gal. metal bbl.), per gal.	.35	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

*Per 175 lb. kegs. †Per 150 lb. lot. ‡Per 425 lb. barrels

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.0415
Brass rods	per lb.	.1712½	.1662½	.1687½
Solder (½ and ½)	per lb.	.41	.3987½	.395
Cotton waste	per lb.	.13@.17½	.13@.17½	15@22
Washers, cast iron (¼ in.)	per 100 lb.	7.00	7.00	7.00
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.55	3.55	3.55
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	.35	.35	.35
Belting, leather, medium	off list	40–5%	40–5%	40%
Machine bolts, up to 1x30 in.	off list	40%	40%	40%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.56	$5.84	$5.65
Emery paper	10.71	11.00	10.71
Emery cloth	29.48	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.45	1.49
Cloth	3.55	3.55	3.20
Fire clay, per 100 lb. bag		.60	.75
Coke, prompt furnace, Connellsville	per net ton		3.00@ 3.15
Coke, prompt foundry, Connellsville	per net ton		4.50@ 5.00
White lead, dry or in oil	100 lb. kegs	New York, 15.25	
Red lead, dry	100 lb. kegs	New York, 15.25	
Red lead, in oil	100 lb. kegs	New York, 16.75	

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1¼ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x½-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ¼x¼-in., 2c. each. Discount 70% for $\frac{5}{16}$-in and smaller and 65% for ⅜-in. and larger.
Case hardened ¼x¼-in., 6c. each, less 50%.

Rivets, button heads, ⅜-in., ½-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4½-in $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1½ to 2-in. long, all diameters, 25c.; ⅝-in. dia., 35c.; ¾-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb. 50c.; countersunk heads, 45c.

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ⅝-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Mass., South Boston (Boston P. O.)—S. Lishner, 710 East Broadway—miscellaneous tools and equipment for repair and service garage to cost $125,000.

Md., Baltimore—L. Rosenfeld Mfg. Co., Russell and Ostend Sts., L. Rosenfeld, Mgr. —machinery for manufacture of dairy and ice cream equipment.

Wis., Green Bay—Northwest Engineering Works, Howard St.—additional machine tools, etc., for proposed plant. here.

Wis., Milwaukee—Engel Tool & Forge Co., 238 Davidson St.—punch press.

Que., Repantigny—H. Grenier, Repantigny —miscellaneous tools and equipment for garage at Valois St. and Montreal Ave.

Opportunities for Future Business

Calif., Los Angeles—Advance Auto Body Works, c/o G. B. Thatcher, 53rd and Figeroa Sts., Contractor awarded contract for the construction of story, 155 x 168 ft. factory, on Macy St. $64,000.

Calif., Los Angeles—I. A. Casing Co., 714 Ducommin St., has had plans prepared for the construction of 1 and 2 story, 130 x 145 ft. factory, at 2600 East 25th St. Estimated cost $40,000. W. D. Lee, 709 Textile Center Bldg., Archt.

Calif., Oakland—Fisher Body, Inc. Hillside Dr. near Foothill Blvd. awarded contract for the construction of a factory annex, on Foothill Blvd. Estimated cost $60,000.

Calif., Santa Barbara — Santa Barbara High School Dist. has had plans prepared for the construction of several 1 story shop buildings. Estimated cost $150,000. W. H. Weeks, Ray Bldg., Oakland, is architect.

Conn., Wallingford — Wallingford Steel Co., Valley St. plans 1 story, 64 x 100 ft. plant addition. Estimated cost $10,000.

Ill., Chicago—Chicago Screw Co., 1026 Homan Ave. awarded contract for the construction of a 2 story, 120 x 124 ft. addition to plant, here.

Ill., Chicago — Economy Pumping Machinery Co., 122 Curtis St. will receive bids about August 21, for the construction of 1 and 2 story, 100 x 177 ft. factory at 3431 West 48th St. A. Epstein, 2001 West Pershing Rd., Archt. Noted July 1.

Ind., Evansville — Hercules Corp., 19 Morton St., awarded contract for the construction of 1 story, 140 x 300 ft., addition to engine factory, to M. J. Hoffman Constr. Co., 403 Furn Bldg. Estimated cost $75,000.

Ind., Ft. Wayne—L. J. McCullough is receiving bids for the construction of a 1 story, 85 x 121 ft. repair shop and garage. Estimated cost $25,000. H. Schnow, Ft. Wayne, Engr. Noted Aug. 12.

Ind., Indianapolis—Parts Corporation, 733 Virginia Ave., awarded contract for the construction of auto parts factory, here. Estimated cost $25,000.

Ind., Lafayette—Fairfield Manufacturing Co. is having plans prepared for the construction of 70 x 200 ft. machine shop, here. Estimated cost $25,000. Private plans.

Ind., Lafayette—Schwab Safe & Lock Co., awarded contract for the construction of 1 story 50 x 125 ft. factory. Estimated cost $25,000.

Md., Baltimore—Bethlehem Shipbuilding Corp. Ltd., South and Water Sts., plans the construction of several new buildings, etc., to enlarge Key Highway plant, here. Estimated cost $2,000,000.

Md., Baltimore—L. Rosenfeld Mfg. Co., Russell and Ostend Sts. L. Rosenfeld, Mgr. has work underway on the construction of a three unit addition to plant for manufacturing dairy and ice cream equipment.

Mass., Lowell—New York, New Haven & Hartford R.R. Co., South Station, Boston, awarded contract for the construction of an engine house, here. Estimated cost $40,000.

What This Section Is

Machinery Requirements and Industrial Construction is a reliable machinery market, because every item is reported first-hand by our own correspondents, scattered over the United States and Canada. These leads are verified by our men. We do not use newspaper clippings, nor do we listen to any hearsay or rumors. These sales leads are as accurate as our men can make them, and as timely as weekly publication will permit.

This market is for *American Machinist* subscribers. It covers the same machinery fields as does the paper. Here will be found inquiries for machine tools, presses, hammers, welding, forging and heat treating equipment, and other machinery for the shop.

Here also will be found reports of proposed industrial construction, where sooner or later machinery will be needed.

Are you making the most of the opportunities listed here?

Mass., Melrose—City awarded contract for the construction of 1 story repair garage. $46,000.

Mass., Northampton—International Silver Co., Florence, awarded contract for addition to hardening building at plant, here. Estimated cost $40,000.

Mass., Salem—J. S. Sawyer, c/o W. H. Hunt, Archt., 197 Washington St., is receiving bids for the construction of a 1 story, 100 x 100 ft. repair and service garage, here. Estimated cost $50,000.

Mich., Muskegon — Standard Automotive Parts Co., Nims St. will soon award contract for the construction of 2 story, 32 x 104 ft. factory on Nims St. Estimated cost $40,000.

Minn., St. Paul—Mack International Motor Truck Corp., 2231 University Ave. awarded contract for the construction of 1 story, 200 x 300 ft. assembly plant on University Ave. Estimateed cost $300,000.

Mo., Nevada—Missouri Pacific R.R. Co., Railway Exchange Bldg., St. Louis will build round house and machine shop, etc., here. Estimated cost $125,000. Work will be done with division forces. E. A. Hadley, Railway Exchange Bldg., St. Louis Ch. Engr. Noted June 24.

Mo., St. Louis—Century Electric Co., 1827 Pine St. will remodel 8 story building for electrical manufacturing on Olive St. Estimated cost $150,000. Work will be done by day labor under supervision of L. Baylor Pendleton, DeMenil Bldg., Archt.

N. J., Camden—Kenwood Co., 515 Market St. awarded contract for the construction of 4 story garage, with 2 shops, etc. at Haddon Ave. and Carman St. Estimated cost $350,000.

N. Y., New York—D. G. Ludins, 99 East 165th St. will build 3 story, 100 x 150 ft. garage on West Houston St. Work will be done by separate contracts.

N. Y., New York—Packard Motor Car Co., Bway. and 61st St., L. J. Eastman, Pres. is having plans prepared for the construction of 3 story, 100 x 300 ft. service station and office on Crotona Ave. Estimated cost $750,000. A. Kahn, 1000 Marquette Bldg., Detroit, Mich., Archt.

N. C., Hamlet—Seaboard Air Line Ry., Baltimore, Md., is having plans prepared for enlarging repair department of engine shops, etc., here. W. D. Faucette, Savannah, Ga., Ch. Engr.

O., Cincinnati—W. E. Huenefeld, 3131 Fairfield Ave., is having plans prepared for the construction of a 7 story, 100 x 140 ft. garage on 9th St. Estimated cost $200,000. Garber & Woodward, 4 West 7th St., Archts.

Okla., Tulsa—F. Casebeer, 1020 East 18th St., awarded contract for 6 story, 75 x 140 ft. garage, $205,500.

Pa., Altoona — M. Smith, Purch. Agt., Pennsylvania R.R. Co., Broad Street Sta., Philadelphia, will receive bids until August 20, for the construction of tank shop and service building, with crane runway, here. Contr. 26-1926.

Pa., Meadville—Hookless Fastner Co., has had plans prepared for the construction of 2 story, plant addition for manufacture of metal zippers. Estimated cost $40,000. W. Watson, et. al., 4614 Prospect Ave., Cleveland, O. Archts.

Pa., McVeytown—Oliver Twp. and McVeytown School Dists. plan 3 story 100 x 140 ft. junior high school, with vocational shops, etc. Estimated cost $150,000.

R. I., Providence—Narragansett Electric Light Co., awarded contract for the construction of 1 story, transformer repair house, on Eddy St. Estimated cost $40,000.

Wis., Cedarburg—American Electric Motors, Inc., 57 Erie St., Milwaukee, is receiving bids for the construction of 1 story, 100 x 300 ft. factory, here. Private plans.

Wis., Green Bay—Northwest Engineering Works, Howard St., is receiving bids for the construction of a 1 story factory, including 102 x 122 ft. repair shop, here.

Wis., Milwaukee—Chain Belt Co., 736 Park St. has had plans prepared for the construction of 1 story, 120x308 ft. structural shop at 39th Ave. and Orchard St. F. D. Chase, Inc., 720 Michigan Ave., Chicago, Ill. Engr. and Archt.

Wis., Milwaukee—Engel Tool & Forge Co., 238 Davidson St. awarded contract for the construction of 2 story, 42x56 ft. shop on Orchard St.

Wis., Milwaukee—Filer & Stowell Co., 219 Becher St. awarded contract for the construction of 1 story shop addition, at plant on Becher St. Estimated cost $40,000.